PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

FINAL
SUPPLEMENTAL FIELD STUDY
SAMPLING AND ANALYSIS PLAN

AUGUST 1994

NTRACT NO. DAAA05-92-D-0002, Delivery Order 0004

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

EBASCO SERVICES INCORPORATED
James M. Montgomery
International Dismantling & Machinery
Greystone Environmental
Hazen Research
DataChem BC Analytical

REQUESTS FOR COPIES OF THIS DOCUMENT
SHOULD BE REFERRED TO THE PROGRAM MANAGER
FOR ROCKY MOUNTAIN ARSENAL
AMXRM-PM COMMERCE CITY, CO 80022

DTIC QUALITY INSPECTED 1

TECHNICAL SUPPORT FOR
ROCKY MOUNTAIN ARSENAL

FINAL
SUPPLEMENTAL FIELD STUDY
SAMPLING AND ANALYSIS PLAN

AUGUST 1994
CONTRACT NO. DAAA05-92-D-0002, Delivery Order 0004

Prepared by:

EBASCO SERVICES INCORPORATED

Prepared for:

U.S. Army Program Manager's Office for the
Rocky Mountain Arsenal

THE INFORMATION AND CONCLUSIONS PRESENTED IN THIS REPORT REPRESENT THE OFFICIAL POSITION OF THE DEPARTMENT OF THE ARMY UNLESS EXPRESSLY MODIFIED BY A SUBSEQUENT DOCUMENT. THIS REPORT CONSTITUTES THE RELEVANT PORTION OF THE ADMINISTRATIVE RECORD FOR THIS CERCLA OPERABLE UNIT.

THE USE OF TRADE NAMES IN THIS REPORT DOES NOT CONSTITUTE AN OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH COMMERCIAL PRODUCTS. THIS REPORT MAY NOT BE CITED FOR PURPOSES OF ADVERTISEMENT.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	08/00/94	

4. TITLE AND SUBTITLE
SUPPLEMENTAL FIELD STUDY, SAMPLING AND ANALYSIS PLAN, FINAL

5. FUNDING NUMBERS
DAAA05 92 D 0002

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
EBASCO SERVICES, INC.
LAKEWOOD, CO

8. PERFORMING ORGANIZATION REPORT NUMBER
94306R02

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ROCKY MOUNTAIN ARSENAL (CO.). PMRMA
COMMERCE CITY, CO

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

19960129 107

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

THE OVERALL PURPOSE OF THE SUPPLEMENTAL FIELD STUDY (SFS) IS TO RESOLVE THE BIOMAGNIFICATION FACTOR (BMF) DISPUTE ISSUE THAT WAS RAISED BY THE EPA UPON ITS REVIEW OF THE AUGUST 1993 DRAFT FINAL INTEGRATED ENDANGERMENT/RISK CHARACTERIZATION (IEA/RC) REPORT. WORK TO BE CONDUCTED IN SFS-PHASE I INVOLVES COLLECTING AND ANALYZING BIOTA TISSUE SAMPLES FROM RMA "AREA OF DISPUTE" (AOD), A SPECIFIC AREA WHERE ECOLOGICAL RISK MAY OR MAY NOT BE PRESENT. IF THE SFS-PHASE I INDICATES THAT UNACCEPTABLE RISKS TO BIOTA ARE LIKELY, THEN A SFS-PHASE II SAMPLING PROGRAM MAY BE INITIATED TO COLLECT ADDITIONAL TISSUE AND SOIL DATA TO ESTIMATE FIELD BMFS FOR SELECTED SPECIES. THIS SAMPLING AND ANALYSIS PLAN DETAILS HOW FIELD SAMPLES WILL BE COLLECTED AND ANALYZED FOR THE CONTAMINANTS OF CONCERN IN THE SFS-PHASE I. THIS REPORT IS ORGANIZED INTO THE FOLLOWING SECTIONS AND APPENDICES: SECTION 1.0- INTRODUCTION. SECTION 2.0- SITE BACKGROUND INFORMATION. SECTION 3.0- FIELD SAMPLING PROGRAM. SECTION 4.0- LABORATORY ANALYSIS PROGRAM. SECTION 5.0- QUALITY ASSURANCE PROJECT PLAN.

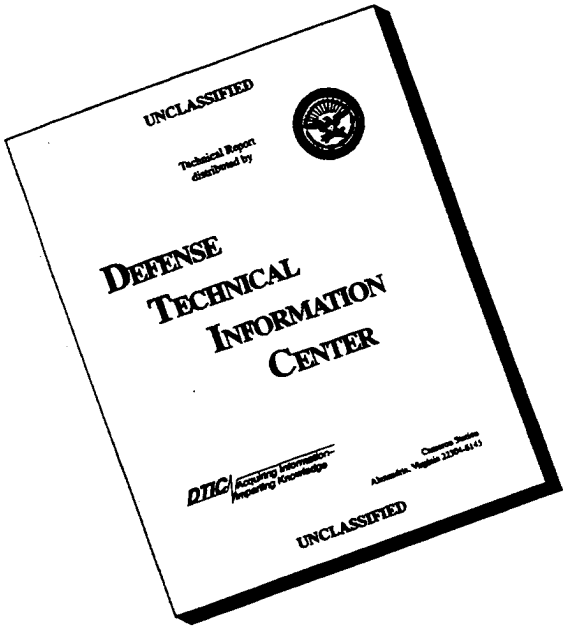
14. SUBJECT TERMS
DECONTAMINATION, BIOMAGNIFICATION FACTOR

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Arsenal Activities Coordination
ANSI/ASQC	American National Standards Institute/American Society for Quality Control
AOD	Area of Dispute
APSTP	Accident Prevention Safety Task Plan
Army	U.S. Army
BCHPD	Bicycloheptadiane
BCRL	Below Certified Reporting Limit
BDMS	Biota Data Management System
BMF	Biomagnification Factor
C-O-C	Chain-of-Custody
CMP	Comprehensive Monitoring Program
COC	Contaminants of Concern
CQAP	Chemical Quality Assurance Plan
CRL	Certified Reporting Limit
DCPD	Dicyclopentadiene
DDE	Dichlorodiphenylethene
DDT	Dichlorodiphenyl trichloroethane
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FDF	Field Data Form
GC/ECD	Gas Chromatography/Electron Capture Detection
GC/MS	Gas Chromatography/Mass Spectrometry
GI	Gastrointestinal
GIS	Geographical information system
GLP	Good Laboratory Practice
g	Gram(s)
GPS	Global Positioning System
HCCPD	Gexachlorocyclopentadiene
Hyman	Julius Hyman and Company
IEA/RC	Integrated Endangerment Assessment/Risk Characterization
IRA	Interim Response Action
IRDMIS	Installation Restoration Data Management Information System
LSD	Laboratory Support Division
LT	Less Than
MDL	Method Detection Limit
µg/g	Micrograms Per Gram
MRL	Method Reporting Limit
OAS	Organizations and State
OCP	Organochlorine Pesticide
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness

PMRMA	Program Manager for Rocky Mountain Arsenal
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
QAMP	Quality Assurance Management Plan
QAPP	Quality Assurance Project Plan
RMA	Rocky Mountain Arsenal
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SFS	Supplemental Field Study
Shell	Shell Chemical Company
SOP	Standard Operating Procedure
STP	State Planar
TRL	Target Reporting Limit
TSP	Trisodium Phosphate
USAEC	U.S. Army Environmental Center
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

1.1 BACKGROUND

The Sampling and Analysis Plan (SAP) presents guidance for collection of the data required by SFS-Phase I of the Supplemental Field Study (SFS-Phase I) (EBASCO 1994a) at Rocky Mountain Arsenal (RMA). The overall purpose of the SFS is to resolve the biomagnification factor (BMF) dispute issue that was raised by the Environmental Protection Agency (EPA) upon its review of the Draft Final Integrated Endangerment Assessment/Risk Characterization (IEA/RC) Report (EBASCO 1994b). Work to be conducted in SFS-Phase I involves collecting and analyzing biota tissue samples from the RMA "area of dispute" (AOD) (Figure 1-1), a specific area where ecological risk may or may not be present, depending on the biomagnification factor used to calculate ecological risk (EBASCO 1994b). Additional sampling of selected species will also be conducted in the part of the eagle exposure area that is in the Bald Eagle Management Area (BEMA) or April 1993 prairie dog towns, but outside the AOD (Figure 1-2). If the SFS-Phase I indicates that unacceptable risks to biota are likely, then a SFS-Phase II sampling program may be initiated to collect additional tissue and soil data to estimate field BMFs for selected species.

1.2 OBJECTIVES

The specific objective of this SAP is to detail how data will be collected during the SFS-Phase I. Once collected, the data will be evaluated relative to fulfilling the overall objective of the SFS-Phase I, which is to determine whether any of a set of risk-based criteria (Figure 1-3) for proceeding to an SFS-Phase II sampling program are exceeded.

1.2.1 Data Collection Objectives

The SAP details how field samples will be collected and analyzed for the contaminants of concern (COCs) in the SFS-Phase I. Thus, one objective of data collection is to provide tissue concentrations of the SFS COCs (aldrin, dieldrin, endrin, dichlorodiphenyltrichloroethane or DDT, dichlorodiphenylethene or DDE, and chlordane) in each of 50 prairie dogs, 20 cottontails, 50 deer mice, 50 starlings, 25 grasshopper samples and 25 ground-dwelling beetle samples collected from

within the AOD (see EBASCO 1994a) at locations determined using a random block design. Another objective is to provide tissue concentrations of the SFS COCs for 30 prairie dogs to be collected outside the AOD but within the bald eagle exposure area (Figure 1-2). Additional objectives are that these tissue data will be collected following good laboratory and field practices and prescribed quality assurance/quality control (QA/QC) protocols.

1.2.2 Data Quality Objectives

The six steps in the data quality objective (DQO) process were laid out and defined for the SAP in the SFS-Phase I Plan (EBASCO 1994a). In that plan, Step 2 states that the "decision that will be resolved with the SFS-Phase I data...is whether the potential risks to prey or predators (estimated from SFS-Phase I tissue concentration data) are high enough to merit a collocated soil and tissue sampling program (i.e., SFS-Phase II)...." Step 3 states that the criteria to determine the need for an SFS-Phase II are based on "...tissue concentrations for each of the sampled prey species...[and] the number of usable samples (n)...."

The DQOs within the SFS-Phase I Plan provide the framework for this data collection effort. Within this framework and the context of the SAP, the DQO steps may be defined as follows:

- Problem Statement (DQO Step 1)—The field collection, necropsy, and chemical analysis of 250 biota samples according to prescribed QA/QC standards
- Decisions To Be Made (DQO Step 2)—The selection of individual organisms to be collected, specific collection locations, and exact data to be collected; the determination of sample handling and preparation, data documentation, and overall QA/QC protocols
- Inputs To The Decision (DQO Step 3)—Guidance from the SFS-Phase I Plan, adherence to Good Laboratory Practice (GLP) standards and intents, established RMA protocols for data collection, formatting, entry, and documentation; laboratory procedures as established by the contract analytical laboratory and approved by the Program Manager for Rocky Mountain Arsenal (PMRMA)
- Boundaries Of The Study (DQO Step 4)—The AOD and the eagle exposure area outside the AOD as defined in the SFS-Phase I Plan

- Decision Process (DQO Step 5)—Presented in a decision tree that reflects the results of discussion between the U.S. Fish and Wildlife Service (USFWS) and Army contractor experienced in biota collection at RMA and RMA EA Technical Subcommittee comment; professional judgment for unanticipated field decisions

- Acceptable Limits On Decision Error (DQO Step 6)—Defined on a species-specific basis for the tissue samples to be collected and on a SFS/chemical-specific basis for the tissue analyses

- Study Design (DQO Step 7)—Provided by this SAP.

1.3 REPORT ORGANIZATION

Following a brief discussion of site background (Section 2.0), the SAP presents the field sampling program (Section 3.0), the laboratory analysis program (Section 4.0), the QA/QC program, and the data management program. For ease of reference, appended materials include protocols for vertebrate necropsy (Appendix A), computer data entry (Appendix B), surveying in sample collection locations (Appendix C), field program forms (Appendix D), and information on persons assigned to various roles and how to contact them (Appendix E).

2.0 SITE BACKGROUND INFORMATION

2.1 SITE LOCATION AND HISTORY

RMA is a 27-square-mile U.S. Army (Army) facility located northeast of Denver, Colorado (Figure 2-1). RMA was established in 1942 to manufacture chemical warfare agents and agent-filled munitions and to produce incendiary munitions for use in World War II. From December 1942 to May 1943, the Army manufactured a chemical warfare agent, Levinstein mustard, in the South Plants manufacturing complex (Figure 2-2). Additionally, a chemical warfare agent, Lewisite, was manufactured at RMA between April and November 1943.

Incendiary munitions were produced at RMA both during and after World War II. Five types of incendiary bombs were either filled or produced at RMA from 1942 to 1946. Once filled, the bombs were stored in open storage areas and in bunkers in sections of RMA east and southeast of South Plants. Although military activities continued at the South Plants once World War II had been concluded, parts of the South Plants complex were leased to private industry, primarily for the production of pesticides. During the 1950s and into the 1960s, obsolete and deteriorating World War II ordnance was demilitarized on post either by neutralizing the contents and burning the remains or by controlled detonation or open burning.

Additionally, RMA served as a production center for the nerve agent Sarin, as a demilitarization center, and as a rocket fuel production and storage area. Between 1950 and 1952, the Army designed and constructed the North Plants complex (Figure 2-2) to manufacture Sarin between 1953 and 1957. Sarin was filled into munitions intermittently between 1953 and 1969. From the 1950s through the 1980s, a wide variety of items were demilitarized at RMA, including agent-filled munitions. Rocket fuel was prepared and stored at RMA between 1961 and May 1982.

Following World War II, records on the use of RMA by private industry for the production of pesticides indicate that nine companies conducted manufacturing or processing operations in South Plants between 1946 and 1982, the year all manufacturing and processing operations in

South Plants ceased. The two major lessees of facilities in South Plants were Julius Hyman and Company (Hyman) (1947–54) and Shell Chemical Company, a division of Shell Oil Company (Shell) (1954–87).

Hyman manufactured the chlorinated pesticides aldrin, dieldrin, and chlordane, and also manufactured or brought to RMA feedstock chemicals used in manufacturing its commercial products. These included hexachlorocyclopentadiene (HCCPD), bicycloheptadiene (BCHPD), dicyclopentadiene (DCPD), hydrogen peroxide, acetylene, and chlorine. In 1952, Shell acquired the stock of Hyman, which continued as a lessor until 1954 when it was merged into Shell Chemical Company. Following the merger, Shell leased and constructed additional facilities in South Plants, producing chlorinated hydrocarbon insecticides, organophosphate insecticides, carbamate insecticides, herbicides, and soil fumigants.

Chemical byproducts from these various activities were introduced into RMA environmental media primarily through the burial or surface disposal of solid wastes, discharge of wastewater to unlined or asphalt-lined basins, and leakage of wastewater and industrial effluents from chemical and sanitary sewer systems. Contaminants were additionally introduced through demilitarization activities, routine application of pesticides, and accidental chemical spills and releases. A more detailed account of the historical activities occurring on RMA is presented in the Remedial Investigation Summary Report (RISR) (EBASCO 1992) and in Appendix A of the IEA/RC (EBASCO 1994b).

The general focus of the SFS-Phase I centers on areas at RMA where contaminant concentrations are moderate and there is disagreement about the presence of potential risk (i.e., the AOD). There is no disagreement regarding the presence of potential risk in the more heavily contaminated portions of RMA (EBASCO 1994b).

2.2 ENVIRONMENTAL SETTING

2.2.1 Plant Communities and Animal Habitats at Rocky Mountain Arsenal

The structure of RMA plant communities and the wildlife habitats they provide result from interactions between native and introduced species of plants and animals, historical and current land-use practices, and abiotic factors such as climate, geology, and topography. RMA is situated within a temperate grassland region and is part of a broad ecotone (i.e., transition zone) between mountain and plains habitats. Native vegetation of the region consists primarily of open semiarid grasslands, with some areas of yucca, shrubland, woodland, and riparian habitats. Anthropogenic activities in the region have altered the landscape to a mosaic of agricultural, developed (industrial facilities, residential areas, and successional parcels), and native habitats.

Currently, 88 percent of the RMA land surface is vegetated. Out of this total, 41 percent supports early successional plant communities, and 19 percent crested wheatgrass, which was used in the 1930s and 1940s to stabilize land susceptible to erosion (MKE 1989b). The remaining 28 percent supports shrubland, patches of yucca, riparian woodlands, cattail marshes and other wetland types, locust and wild plum thickets, upland groves of deciduous trees, and ornamental plantings. Each of these varied plant groups provides potential wildlife habitat.

2.2.2 Animals at Rocky Mountain Arsenal

Formal ecological inventories of the animals at RMA began in the mid-1970s (RLSA 1988). These studies documented a diversity of species that may require specific habitat types (e.g., the Brewer's sparrow requires sagebrush shrubland), or inhabit a range of habitat types (e.g., the black-billed magpie and coyote can be found in all terrestrial habitats at RMA). For RMA fish communities, management history also plays a particularly important role in determining the species present and their population dynamics.

Twenty-six species of mammals have been observed at RMA, a number that includes all of the common mammals that inhabit the prairie grasslands of the Colorado Front Range (Armstrong 1972; Bissel and Dillon 1982).

One hundred seventy-six species of birds have been observed at RMA, which is approximately 40 percent of all bird species recorded in the State of Colorado (Bailey and Niedrach 1965; Chase et al. 1982). The species richness of RMA avifauna is high relative to that of the region. A variety of ground-nesting songbirds and other birds preferring open habitat are common in the primary RMA habitats of open grassland and weedy plains. At least two regionally rare or declining species (Cassin's sparrow and Brewer's sparrow) are relatively common breeding birds at RMA (Webb et al. 1991). Raptor population density and species diversity are comparable with those at other sites in the region (MKE 1989a). Winter raptor populations, particularly that of the bald eagle, are a primary attraction for the 20,000 to 30,000 visitors that come to RMA during this season (USFWS 1992).

Several species of reptiles and amphibians may be encountered in nearly every habitat type at RMA. Incidental observation has recorded 61 percent or 17 of the 28 species of reptiles and amphibians that could potentially occur at RMA.

The four southern lakes (i.e., Lake Mary, Lake Ladora, Lower Derby Lake, and Upper Derby Lake; Figure 2-2) are the primary bodies of water at RMA. Studies indicate these lakes support viable aquatic communities, although macrobenthic organisms appear to be largely absent. Differences among lakes in fish species content and in relative numbers within species are primarily attributable to differences in stocking and management (e.g., catch-and-release fishing).

The six species or species groups being collected under this SAP (black-tailed prairie dog, rabbits, deer mouse, starling, ground-dwelling beetle, and grasshopper) were selected as detailed in the SFS-Phase I plan (EBASCO 1994a) not only because they are the most important prey species but because they provide both data that is specific to the species as well as data that provide information on food-chain doses for top predators.

2.3 SUMMARY OF PREVIOUS FINDINGS

Adverse effects of contamination at RMA were severe in the past, as is indicated by documentation of water bird die offs and fish kills in the lakes associated with contaminant releases (RLSA 1988). The weight of evidence from ecological observations during the past decade indicate, however, that the overall ecosystems and animal communities have retained their integrity and most wildlife populations appear healthy. RMA populations that perform (i.e., reproduce, survive, grow, etc.) as well as or better than the general populations in the region are considered to be healthy without evidence to the contrary. Nonetheless, since RMA populations are not subject to many modern-day wildlife impacts (e.g., hunting and agricultural practices), comparisons to populations that are subject to such impacts must be qualified. Furthermore, there is inherent uncertainty as to the properties that constitute population health.

Adverse effects to individual organisms at RMA continue to be observed. Although broods of American coots and mallards or blue-winged teal were documented from 1988 through 1990, reduced reproductive success of mallards in RMA lakes was documented in 1986 (ESE 1989), the year the last RMA waterfowl reproduction study was conducted. These observations, along with continuing, but occasional, observations of dead and dying raptors, suggest some adverse effects of contamination may still be occurring. This conclusion is supported by tissue concentration data (RLSA 1992; EBASCO 1994b, Appendix Attachment C.5-2) and food-web model results. These adverse effects on individuals, however, are not apparent at the population level given the available data on localized populations of sedentary species and on RMA-wide populations of more mobile species (EBASCO 1994b, Appendix Section C.5). Recently, interim response actions (IRAs) have been completed in an effort to reduce localized sources of high contamination. Some of the IRAs (i.e., those conducted at Basin F, the Shell Trenches, and the Lime Basins) were completed between May 1989 and October 1993. These activities may have decreased wildlife exposure to contaminants in these areas of RMA.

The results of the three BMF calculation approaches show areas of potential risk in the more central areas of RMA (EBASCO 1994b). These areas vary in magnitude and precise geographic

extent for each trophic box/chemical combination. All three methods indicate that potential risk of low magnitude is present within the single exposure area evaluated for the bald eagle and that this risk is driven by specific hot spots included within the exposure area. Outside the central areas, are trophic box/chemical-specific areas where calculations using the largest of the three BMF values show the presence of potential risk, but where calculations using the smallest of the three IEA/RC BMF values do not show the presence of potential risk. The area of unresolved risk between the results of these two calculations for the deer mouse and aldrin/dieldrin was selected to define the AOD for the SFS-Phase I.

3.0 FIELD SAMPLING PROGRAM

3.1 OVERVIEW

Under the SFS-Phase I, six species (or species groups) are to be collected within the AOD on RMA during the late spring, summer, and early fall 1994. Each of these species must be collected during a specific time frame and according to both general and species-specific sampling procedures. Table 3-1 summarizes the life stage, season, method, tissue, and number of samples to be collected for each species.

3.1.1 Sampled Biota

The biota to be collected include the following: black-tailed prairie dog, rabbit (either desert or eastern cottontail) or blacktailed jackrabbit, deer mouse, starling, ground-dwelling beetles, and grasshoppers. The goal is to collect individuals that have been maximally and solely exposed to contaminants in an area centered on the collection location and that are heavy enough to comprise a minimum sample weight. To meet this goal, the following types of individuals are targeted for collection:

- Prairie dogs—One-year-old male juveniles (collected before the spring dispersion of male yearlings) or 1-year-old female juveniles or adults (if collected after the dispersion of the yearlings). If 1-year-old female juveniles or adults are collected using traps, they should not be collected if they are lactating. If adults are collected using firearms, they must not be collected until the young of the year are above ground and as mature as possible, yet still small enough to be differentiated from the adults.

- Rabbits—Individual adults.

- Deer mice—Individual adults weighed to meet a required minimum 20-gram (g) sampling weight. Females that are obviously lactating must not be collected.

- Starlings—Juveniles within 1 to 2 days of fledging.

- Beetles—All individuals found in the pit traps, regardless of taxon.

- Grasshopper—All nymphal individuals, regardless of taxon.

It should be noted that during sampling an individual of the wrong type may occasionally be collected. For example, a large juvenile may be mistakenly collected as an adult specimen. In these instances, the individual should still be used as a sample, and the protocol deviation should be described in the field notes and field program deviation form (see below).

3.1.2 Sampling Schedule

Sampling is to be performed in the late spring, summer, and early fall 1994 (Table 3-1). The exact timing of the sampling events will depend on the phenology of these seasons, but will follow this general schedule: first juvenile prairie dogs; second rabbits, deer mice, and starlings; and third ground-dwelling beetles and grasshoppers. Adult prairie dogs are to be collected once the young of the year are above ground, a time period that may overlap with the collection of other species. Deer mice and starlings and beetles and grasshoppers should be collected simultaneously to maximize the efficiency of the field day.

3.1.3 Sampling Procedures

The following general collection methods shall be used to collect samples for each species:

- Prairie dogs—Collection using a live trap or .22-caliber rifle so that specific individuals can be selected.
- Rabbits—Collection using a live trap, .22-caliber rifle, or shotgun so that specific individuals can be selected.
- Deer mice—Collection using live traps so that specific individuals can be selected.
- Starlings—Collection by hand from nest boxes.
- Beetles—Collection using pit traps (1-gallon cans embedded in the soil flush with the ground surface).
- Grasshoppers—Collection from vegetation by hand or using sweep nets.

After collection, deer mice are dispatched by cervical separation, starlings by cervical separation or by carbon dioxide in a closed asphyxiation chamber, and prairie dogs and rabbits by carbon

dioxide in the asphyxiation chamber or by a pellet gun. Necropsies are performed on all vertebrate specimens and samples prepared and packaged according to species-specific protocols. All samples must be frozen for a minimum of 48 hours and a maximum of 3 months before they are shipped to the analytical laboratory (see Section 3.3.4).

3.2 PROTOCOLS FOR WORKING AT RMA

3.2.1 Training

All SFS–Phase I personnel must read the following documents before collecting biota at RMA:

- Sampling and Analysis Plan
- Accident Prevention Safety Task Plan (EBASCO 1994c)
- Quality Assurance Management Plan (EBASCO 1993), Sections B-2, B-3, and B-5 only

Copies of these documents are available in the Denver EBASCO office, in the field vehicle, and in the base trailer at RMA. Prior to entering the field, field team members must complete a signoff sheet to verify that each of these documents has been read. Moreover, these personnel must verify that they have a current physical on record, and that current and appropriate health and safety training has been completed. Questions regarding these matters should be directed to the Field Coordinator for resolution or other direction.

3.2.2 Coordination

3.2.2.1 Meetings

Responsibilities of the SFS-Phase I personnel include coordination with ongoing operations, coordination with USFWS and RMA Security regarding the use of firearms, and coordination with USFWS or other Organizations and State (OAS) members regarding specific sampling activities in which they may participate. Coordination with ongoing operations is to be accomplished by attending the weekly USFWS Tuesday morning coordination meetings (0730, Building 111).

3.2.2.2 Use of Firearms

Coordination regarding the use of firearms involves bringing a firearm to RMA Security between 0800 and 1500 so that it can be described, its serial number recorded, and a permit (or letter authorizing its use) issued before it is used the first time at RMA. The issued permit must be in the possession of the gun-bearer at all times. The person registering the firearm is responsible for it at all times when at RMA. At the end of a day in which firearms are used for collecting, the firearm must be taken off post (following appropriate protocols for firearm transport in a vehicle) until it is needed again for collection at RMA. Ammunition use must be documented. Details on planned use of firearms, including the type of firearm to be used, target species, and time and location of use, must be communicated to the Field Coordinator by Monday of the week prior to their use. Further, whenever firearms are to be used, this same information must be communicated to RMA Security or to the USFWS (if approved by RMA Security as its designee) on the day of planned use (or the day prior if sampling activities are scheduled very early in the day). There may need to be more frequent communication via cellular telephone if requested by RMA Security or its designee.

Field personnel shall not carry firearms in the field unless the latter are a part of the day's planned collection activity. This restriction is based on a need to ensure basic health and safety of the public and RMA and contractor staff on post. Accordingly, it is the intent of USFWS to accompany the field personnel each time firearms are to be used during collection activities. In these instances, the USFWS Personnel Coordinator generally requires a 2-day lead time to arrange a meeting time and place.

A final coordination responsibility concerns ongoing and activity-specific coordination with USFWS regarding field activities in which their personnel will actively participate. If Shell, EPA, or the State of Colorado wants their representative to accompany field teams as an observer, this should be arranged through the QA Coordinator in association with scheduled audits.

3.2.2.3 Deviations from the SAP

Additional responsibilities of SFS-Phase I personnel also include documentation of substantive deviations from the details of this SAP and communication of these deviations to the Army, which will determine how this information is to be shared with OAS. A field program deviation form is included in Appendix D. Laboratory corrective action procedures are incorporated by reference in Section 4.0. The SFS-Phase I Quality Assurance Project Plan (QAPP) has established procedures request forms, nonconformance report forms, corrective action requests, and corrective action response forms that must be used on an as-needed basis. These are incorporated by reference in Section 5.0.

3.2.3 General Field Protocols

The Field Coordinator must discuss an upcoming collection effort with the assigned field team members at least once a week before the work starts and make certain that all equipment needs have been met. By the Monday afternoon prior to any week during which sampling activities will be conducted, the Field Coordinator should know what the anticipated field schedule and activity will be. The Field Coordinator must have this information for the USFWS Tuesday morning coordination meeting (0730, Building 111).

Each time field personnel arrive on post, they must:

- Check in at the Visitor's Center to obtain a temporary badge and vehicle pass, (unless a permanent contractor's badge and vehicle pass has already been issued).
- As necessary, coordinate with RMA Security or USFWS regarding the use of firearms during collection activities (see above).
- Check in at the SFS-Phase I base trailer after entering RMA if activities are to be conducted downrange.
- Check in with the person monitoring the USFWS radio and/or with the person monitoring the EBASCO Environmental Air Program radio, depending on who will be providing base support for the day.

Upon arriving at the SFS-Phase I base trailer the first time for collection of a particular species or species group, field team members must:

- Sign out the major pieces of equipment that will be needed from the Field Coordinator.
- Complete, sign, and date the field procedures verification form (Appendix D) to verify that the species-specific procedures are understood.

Upon arriving at the base trailer each time, field team members should:

- Check in with the Field Coordinator and provide specifics of where they will be working and their anticipated schedule.
- Obtain a radio, personal protective equipment (PPE), and other equipment appropriate to the day's work.
- Obtain additional equipment as needed at the storage warehouse.

The Field Coordinator should know where all equipment is stored, and should have been previously notified of the field work that is being done and the equipment that is needed. The radio should be kept nearby during work activities, and check-in calls should be made to USFWS or Air Program radio monitors to report major changes in location especially if firearms are being used.

The best times for biota sampling will vary with the species being collected, the weather and the season, and may involve a "split shift" type of schedule. When possible, sampling activities should be coordinated with other ongoing field work at RMA (except when firearms are being used). Typical work hours are 0600 to 1600. When firearms are to be used, the mid-day period (0900 to 1500) should be avoided (if possible) because public tours are numerous during this time frame. If the activity in question does not require the Field Coordinator to be present and the field team is working without base-trailer support, the mobile telephone may be used to provide support in emergency situations. Use of the mobile telephone must be cleared with the Field Coordinator.

3.3 GENERAL PROCEDURES

This section provides general procedures that are applicable to all biota being collected. Section 3.4 provides species-specific details.

3.3.1 Sampling Location

As described in the SFS-Phase I plan, a random block sampling pattern is to be used in both the AOD and in the bald eagle exposure area outside the AOD. Random block sampling realizes the benefits of systematic sampling (uniform coverage) and random sampling (adherence to the statistical assumptions on which the formulas for evaluation sample sizes and confidence limits are based) (Gilbert 1987).

The number of blocks to be sampled randomly reflects the number of samples to be collected for each species: if 50 samples are collected, 50 blocks will have been randomly sampled. The number of samples to be collected of each species was based on analyses by standard statistical methodology that relates sample size to statistical power. Conclusions from the sample size analyses were presented in the SFS-Phase I Plan (EBASCO 1994a) and resulted in the numbers given in Table 3-1.

3.3.1.1 Selection

In general, random block sampling involves dividing a given study area into blocks of equal size (usually equal area) and taking one sample at a random location within each block. Partial blocks occurring at the AOD edges receive one or no samples, with the probability of one sample equaling the area of the partial block divided by the area of a whole block. In the SFS-Phase I, the random block approach shall be applied to each species being collected as described below.

When no sample is collected in a block designated for sampling, field team members should inform the Field Coordinator, but should not sample an undesignated block for a replacement sample. The decision on how to deal with missing samples will be made by the Technical and Statistical Leads once most samples for a given species have been collected. If a species is not

collected from several blocks, the missing data blocks will either be ignored or a value for the missing data blocks will be estimated from data for the surrounding blocks. This choice will be made after sampling has been attempted for all blocks because the choice depends on the spatial patterns of missing blocks and underlying contaminant distribution. If data are missing from numerous blocks, then the collection of additional samples may be desirable to increase the statistical power. The location for these additional samples will be based on the location of samples already collected and additional information such as the distribution of soil contamination and appropriate habitat for a given species.

The procedure for selecting sampling locations for each species shall be as follows:

- Prairie dogs—Prairie dog towns present as of April 1993 and within the AOD are to be divided into 50 blocks and prairie dog towns present as of April 1993 and outside the AOD are to be divided into 30 blocks. A geographic information system (GIS) will be used to first select the block size that best approximates the required number of blocks and then to draw the blocks. The probability of sampling fractional blocks is to be weighted based on fractional block size. Sample sizes do not provide equal areal representation of the AOD and sampled portion of the bald eagle exposure area. Therefore, data from these areas will be really weighted to calculate the mean prairie dog tissue concentration for the eagle exposure.

- Rabbits—The AOD is to be divided into 20 blocks. The GIS will be used and the probability of sampling fractional blocks will be weighted as for prairie dogs.

- Deer mice—The AOD is to be divided into 50 blocks. The GIS will be used and the probability of sampling fractional blocks will be weighted as for prairie dogs.

- Starlings—The 13 groups of nest boxes established by the USFWS starling monitoring program in 12 sections at RMA are to be used as sampling locations. Based on a preliminary map, most nest boxes in four of these groups are clearly within the AOD. The 50 specimens are to be collected from the nest boxes within the AOD. The Field Coordinator is to check with the Technical Lead who will coordinate with USFWS to initiate the collection of starlings. At group locations where there are more occupied nest boxes than allocated samples, the boxes to be sampled will be randomly selected. If USFWS has a conflict with the use of the nestlings at a randomly selected box, another box is to be randomly selected in the same manner.

- Beetles—The AOD is to be divided into 25 blocks. The GIS will be used and the probability of sampling fractional blocks will be weighted as for prairie dogs.

- Grasshoppers—Grasshopper collection will be at the same randomly selected locations used for beetle collection within each block.

3.3.1.2 Documentation

The sampling location for each species within the random block design shall be identified with an alphanumeric location identifier that will become part of the Site Identification number used in the Installation Restoration Data Management Information System (IRDMIS) data-tracking system (Section 3.3.3.1) and also by its x,y coordinates expressed in State Planar (STP) coordinate system units. For all species except starlings, the location identifier is a species-specific letter, and a four-digit location number as explained in Section 3.3.3.2 (i.e., DB016 = deer mouse block number 16). The species-specific letters are as follows: P, prairie dog; D, deer mouse; R, rabbit; S, starling; B, beetles; and G, grasshoppers. In the location identifier for starlings, the "S" for starling is followed by a number designating the section of the group location and a two-digit number identifying the nest box at the group location (i.e., S0115 = starling group location in Section 1, 15th nest box).

There will be two sets of x,y coordinates associated with each sample, the randomly selected sampling coordinates that are used as starting points for sampling, and the coordinates of the actual sample collection location. The locations for the randomly selected sampling coordinates used as starting points for sampling are approximate for two reasons: (1) the closest available appropriate habitat within the block will be used for actual collection, and (2) this location will be either visually identified from a distance (to avoid disturbing the individuals being hunted) or paced off, depending on the species. If the closest available habitat within the block is not apparent from the starting point, a search toward the furthest boundary of the block will be initiated. If all boundaries are approximately equidistant, a randomly selected direction will be used. The actual sample collection location is to be documented by a global positioning system (GPS) or standard survey method, and will have a precision error of $\pm$ 16 feet (ft) (5 meters [m]).

3.3.2 Sample Collection Procedures

Before an organism is collected, it should be accurately identified. The species-specific sampling procedures provide a brief summary of identifying characteristics, and field guides provide additional detail; the latter should be carried in the collection vehicle when sampling. The variety of taxa to be collected requires a variety of collection procedures. If firearms are used to collect specimens, the permits secured for each firearm must be in the possession of the gun-bearer at all times. The person registering the firearm is responsible for it at all times when at RMA. Other types of collection, such as trapping, have less potential impact on other personnel at RMA. However, all collections should be coordinated through the weekly USFWS Tuesday morning coordination meeting (0730, Building 111). This will help coordinate all activities ongoing at RMA.

To support the collection of each species, an RMA-wide map superimposed with the numbered blocks (or group nest locations), a map of each section containing sampling blocks for a species, a map of each block or group nest location (and for deer mice a map of the five-trap by five-trap trapping grid), a list of the randomly selected sample collection starting points for each block (or group nest location), and the materials for data recording (Section 3.3.3) are needed. Copies of the RMA-wide and section maps are provided in Appendix D for all species except starlings. For the most part, other sampling equipment and supplies are unique to the species being collected and are listed in Table 3-2.

3.3.3 Data Recording

All field activities are to be documented according to very specific guidelines. Data from daily field and laboratory activities shall be recorded in data notebooks, with sample-specific data recorded on a field data form (FDF), chain-of-custody (C-O-C) form, and sample tag. Copies of these forms are included in Appendix D. The information that must be included on these forms is identified below. Professional judgment should be used as to the recording of additional pertinent information in the Field Notebook.

3.3.3.1 Data Notebooks

Data shall be written in waterproof black or blue pen in standard engineering notebooks. Several data notebooks are to be used: Field Notebooks carried by each collecting team and the Laboratory Notebook. In every data notebook, each page is numbered using a six-digit identifier. The first three digits refer to the book number and the last three to the page number. For example, SFS-022-001 refers to book 22, page 1. Each of these entries must be initiated to indicate who is taking notes of the day's activities. The duration of each activity is recorded in military time. Incorrect entries are to be corrected by drawing single lines through the written material. Each such strikeout must be initialed. The Quality Assurance (QA) Manager is responsible for issuing data notebooks and recording information regarding their issuance (see Section 5).

Information to be recorded in the Field Notebooks includes team members' names, starting and ending time, activity, location of work, sites worked in or near, species sought, and general observations throughout the day. Recorded information about the locations where the target species are being sought for collection must include block number and information about the distribution of appropriate habitat, the species, and the pattern of attempted collection. The following is an example of an entry:

> "In B140, prairie dogs were observed only in the SE ¼, about 50 ft north of the random starting coordinates (Sx=2189497, Sy=180717); sample #0912-05/24/94-MJ-CYLU was collected by rifle and a spike was driven into yellow flagging at the collection location (approximate coordinates of Tx=218950, Ty=180780), which is about 600 ft E of the intersection of 7th and E Streets."

It should be noted that distance on the ground should be recorded in feet because the STP coordinates available for RMA maps are in feet. The GPS reads only in meters and will need to be documented in meters and later converted. Therefore, be very careful to <u>always</u> record the units with distance measurements. All other measurements are in metric units.

Additional data can be recorded in the field notebook as appropriate. Such information might include unusual physical characteristics, an estimate of specimen age based on the characteristics observed (plumage, pelage, etc.), relative percentages of visually distinct types as described for grasshoppers, data on any photographs taken, (photographer's name, date, roll number, frame number, location and subject of photographs), whether any of the species to be collected at a given assigned sample location were absent, and whether the sample was collected within the boundaries of the sample block and within the species-specific sampling area. If collection outside the sampling area was necessary, the information (contamination data, habitat, etc.) used to choose the area of further search should be summarized.

Sample tag numbers are assigned by the computer. For completed samples, the final sample tag numbers should all be preceded by a "B". If a specimen is incipient (e.g., it is a potential replacement sample, or weighs too little to comprise a complete sample by itself), it is preceded by an "F" number since it is recorded by the computer program as a fortuitous sample. The "F" numbers are also assigned consecutively, and should be converted to "B" numbers when a sample is identified as complete.

The Laboratory Notebook shall be used to record the sample tag numbers of the samples processed for the day (and the temporary sample identification number assigned in the field, as discussed below) and any difficulties or unusual circumstances encountered during sample preparation for the day. Data sheets that contain necropsy information for each vertebrate sample prepared as well as taxonomic information for each insect sample are to be cross-referenced to the Laboratory Notebook. The necropsy of each vertebrate sample shall be conducted according to the protocols described in Appendix A and its results recorded on preprinted data sheets that include data fields for the following information: sample tag number, species, date, and necropsy data (see Appendix A). Whether the necropsy results were normal or abnormal should be noted in the Observations and Abnormalities section of the FDF, which should also cross-reference the Laboratory Notebook number and page and the data sheet on which any abnormal results are described. For both grasshopper and beetle samples, the taxa included in each sample should be

identified and listed with the sample tag number on preprinted data sheets that are also cross-referenced to the Laboratory Notebook number and page.

3.3.3.2 Sample Tag, Field Data Form, and C-O-C Form

An FDF, sample tag, and C-O-C form shall be completed each time an individual sample is processed, whether the sample is intentional or incipient. With the exception of the sample tag number (as noted below), all three sheets are completed identically for intentional and incipient samples.

The sample tags (Figure 3-1), C-O-C forms (Figure 3-2), and FDFs (Figure 3-3) are similar to those that were used for the Comprehensive Monitoring Program (CMP) (RLSA 1992). These data sheets are to be filled out in the laboratory using a laptop computer (see the procedure detailed in Appendix B). Once entered, this information is output on preprinted five-ply forms and checked by a second person before being attached to the sample (sample tag) or placed in the appropriate folder (FDF and C-O-C form) in the freezer at the end of the day.

On the FDF, sample tag, and C-O-C form, the following data shall be recorded:

- Ten-digit Site Identification (ID) number (as described above and below)
- Sample tag number as a consecutive number with the format "B0001...B9999" as described below
  - — If the sample tag number is an "F" number rather than a "B" number, it should be written in the margin so that the "B" number can be put in the proper field when the conversion occurs
  - — Where multiple tissues from the same specimen comprise several samples, the format "B0001A...B9999Z" should be used with the letter designations as defined below
- Site type, always filled in "BIOL"
- Collection date in a six-digit format (i.e., month/day/year)
- Collection time using military time (i.e., 0001 to 2400 hours)

- Technique, always filled in with a "G", defined in the U.S. Army Environmental Center (USAEC) users' manual as a grab sample, but used here primarily as a space filler since the actual information will be filled in on the FDF

- Species as the four-letter code from the data sheet, defining starling as STVU and jackrabbit as LECA when needed under "other" (on the sample tag, common names should be spelled out completely)

- Tissue as the one- or two-digit code from the data sheet (C-O-C form only)

- Samplers' names as hand-written signatures

All entries must be right-justified. The format by which the 10-digit Site ID number is compiled must never vary. All Site ID numbers must be compiled according to the following protocol (see also Table 3-3):

- Digit 1—Always "B" for biota.

- Digits 2 and 3—Always "SI" to signify SFS-Phase I sample data.

- Digit 4—Always one of the following: P for prairie dog, R for rabbit, D for deer mouse, S for starling, B for beetles, and G for grasshoppers.

- Digits 5, 6, 7, and 8—Always serve as the location identifier. Digit 5 is always a "B" or an "A" (except for starlings), indicating that the following three digits are a block number. (The "A" was used only with prairie dog block numbers in the bald eagle exposure area and outside the AOD.) It should be noted that three digits should always be used for the block number, even if the number is less three digits in length. For example, block #5 would be indicated as "005". When Digit 4 is an "S" (i.e., for starlings), then Digits 5 and 6 are a number designating the section of a group nest location and the following two digits are a nest box number.

- Digits 9 and 10—Always indicates the collection year (e.g., "94").

Any new acronyms shall be defined in the Field Notebook the first time they are used. Table 3-3 illustrates the site identification number compilation and lists the section numbers at RMA.

As described in Section 3.3.1.2, samples are also identified by the pair of x,y coordinates for the location where the sample was collected. As noted above (Section 3.3.1.2), the x,y coordinates

that identify the collection starting location within a block are to be randomly selected and listed together with the block number in a table, which also lists three additional xy locations to be used in sequence, if needed. These starting xy coordinates (Sx, Sy) are to be recorded in the field notebook as the approximate (i.e., paced or visually scaled off, but not surveyed) starting point. The location of actual sample collection is to be marked in the field with a metal stake hammered flush with the ground and with engineering flagging. It must also must be marked on the block-specific map with an "X" that will later be surveyed to establish the precise (to $\leq \pm 5$ m) coordinates (Fx, Fy). In the interim, the actual sampling location should be described in the field notebook or on the annotated map in sufficient detail that it can be found by a person who has not seen the site previously. Tentative x,y coordinates (Tx, Ty) for the "X" can be read from the map and noted in the field notebook when the sample is collected if these tentative coordinates will aid in relocating the stake and flagging at the collection location. Surveying shall be accomplished with GPS using the approach described in Appendix C, unless it proves inefficient or inaccurate, in which case traditional survey techniques are to be substituted.

When more than one sample comes from a specimen because residual tissues (i.e., tissues removed to prepare a dressed carcass—skin, head, and feet for mammal; feathers, beak, and tarsi for birds) are also collected, the numeric portion of the sample tag number should be the same for all samples from that specimen. Individual samples are differentiated by the addition of an "R" to designate the residual sample. For cottontails, the sample tag number with an added "H" to designate a head saved for taxonomic identification shall accompany the foil-wrapped head which will be stored in the freezer.

The species name and tissue type must be spelled out on the sample tag to guide the laboratory's sample preparation since these data do not go on the laboratory's Chemical Data Coding Form.

Samplers' names initiate the C-O-C process. It is important that the sampler's signature be used; names should be printed underneath if the signature is not legible. Samplers then sign the C-O-Cs over to the necropsy person, who signs the samples over to the freezer.

The FDF has a standard allocation of fields that must be used for all samples. The FDF contains most of the data on the sample tag and C-O-C forms (site identification, sample tag number, collection date, and species and tissue, but not site type or technique); these data are filled in on the FDF in the same format as they were entered on the sample tag and C-O-C form. All of these forms are prepared using the laptop computer as discussed in Appendix B.

The FDF also contains some additional items of general information, including the following:

- Sample location, recorded as county, range, township, section, and quarter section
- Collection coordinates, marked with an "X" on the map accompanying the FDF; the tentative STP location coordinates for this "X" are read from the map as northing and easting coordinates (Tx, Ty) and written in the field notebook; the final STP coordinates (Fx and Fy) from surveying are to be written by hand in the FDF data boxes after surveying is complete
- Habitat type, recorded from the vegetation map for RMA in the base trailer
- Collection method, life stage, and sex are all selected from among the categories listed on the FDF
- Sample weight, recorded as weighed to the nearest 0.1 g, except where weight exceeds 100 g, when it is rounded to the nearest whole number

There is also a section on the FDF for data specific to the various organisms being collected. In the first species-specific field, the nest box number is to be recorded for all starling samples, or the number of the trap in which the deer mouse sample was caught is recorded. For all composite whole-body samples of animals (grasshoppers and beetles), the number of individuals in the sample is recorded. If a reserve deer mouse is collected because the mouse collected in the block weighs between 15 and 20 g, the reserve mouse must be given an "F" number (not a "B" number) on a separate set of data forms. Soil type from the soil map of RMA in the base trailer is to be recorded for deer mice and prairie dogs. The number of readily recognizable taxa in the sample is also recorded for grasshoppers and for beetles. The area swept (in square meters) is to be recorded for grasshoppers. Note that a list of the taxa in each grasshopper and beetle sample should be recorded in the Field Notebook.

Field entries must be right-justified on the data sheet, or be aligned by decimal point, and recorded in the units indicated on the FDF. If the weight of the sample allows, a specimen of each type of grasshopper and beetle collected during the summer should be saved in ethanol as a reference collection of the taxa that were sampled on RMA. One specimen of at least the most common taxa of each species must be saved.

3.3.3.3 Sample-Specific Data Recording

In the field at the time of sample collection, a temporary sample identification number that consists of the collection time and date, the collector's unique initials, and the species acronym (e.g., 0900-5/24/94-MJ-PEMA), must be assigned and remain with the specimen as well as recorded in the Field Notebook. The temporary number will be converted to a final sample tag number in the laboratory when the sample is prepared. The following information should also be recorded in the field notebook: block number (or group location letter and nest box number), Sx and Sy and Tx and Ty coordinates, and collection method. For grasshoppers, the size of the collection area must also be recorded in square meters. A map identified with the temporary sample identification numbers should also be annotated for each sample as follows:

- Prairie dogs—On the block-specific map, mark the location where an individual was first seen with an "S". This mark should be made in the field and, if possible, prior to stalking the animal. Once collected, the actual sample collection location should be marked with an "X".

- Rabbits—On the block-specific map, annotation as above for prairie dogs.

- Deer mice—On the block-specific map, mark the initial corner of the trapping grid with an "X"; the map of a standard five-trap by five-trap grid should be annotated by circling the trap in which the specimen was caught as the actual sample collection location and noting any deviations in layout of the trapping grid.

- Starlings—On the group-location-specific map, circle the nest box from which the specimen came.

- Beetles—On the block-specific map, mark the location of the pit trap with an "X" and note the location of any lawn edging used as trap wings.

- Grasshoppers—On the block-specific map, mark the center of the circle being swept with an "X" and draw an outline of the area being swept.

These and other data will be recorded on the sample tag, FDF, and C-O-C form, as appropriate, using the laboratory laptop computer. Maps will be available in the laboratory to determine habitat type and soil type.

At the end of the day when a sample is collected, the data forms and sample preparation must be completed, sample tags taped to the sample with strapping tape, C-O-C forms for both intentional samples and incipient samples signed over to the freezer and placed in separate B-C-O-C and F-C-O-C files in either the freezer or filing cabinet and the freezer and filing cabinet locked. The C-O-C forms must remain with the samples until they are signed out of the freezer for shipment and they must accompany the samples during shipment. Completed FDFs must be placed in either the BFDF files or the FFDF files in the freezer or filing cabinet. The FDFs for incipient samples will still be lacking final "B" sample tag number that shall be assigned when the incipient sample is converted into an intentional sample. At the end of the sampling day, four copies of the maps associated with completed intentional samples should be made. These copies should be kept with the five-ply FDF. Once the data are complete and the samples are being shipped to the laboratory, the original map(s) and one copy should be attached to the original and first copy of the FDF, and together with two copies of the sample tag, a copy of pertinent field notes, and a transfer file of the data entered into the computer should be sent as a data packet to the QA Manager. Another FDF/tag/map set should be placed in files for completed samples in the biota filing cabinet. When the samples are shipped, one of the two remaining FDF/tag/map sets goes to the RMA Shipping Coordinator and the other goes to DP and Associates (DP). To ship samples, the C-O-C form is signed by the person packing the cooler as well as by the RMA Shipping Coordinator, at which time the back three copies are removed, two for the QA Manager and one for DP (The remaining two copies are to be signed over to Federal Express, or other carrier, by the RMA Shipping Coordinator, who keeps one copy while the carrier signs the original C-O-C form over to the contract analytical laboratory, which will incorporate it into the data packet for the sample.)

In the office, the QA Manager should log in the data packet (2 FDFs on top, then map and field notebook pages) and check it for completeness and accuracy immediately. The QA Manager then logs out the second FDF to the Project Data Manager, who checks the transfer file against the FDF and initiates its data tracking system then returns the second FDF to the QA Manager to verify completion of data entry. Meanwhile, the QA Manager logs out the original FDF and associated map(s) and field notebook pages to the archive files and the copy (minus the second FDF) to the QA file. The final column in the QA log verifies the completion of data QA/QC and entry by documenting the return of the second copy of the FDF to the QA file.

3.3.4 Sample Handling

Some of the organisms die as a result of collection, while others need to be dispatched. Warm-blooded organisms that are still alive when captured are to be dispatched by cervical separation (deer mice) or placed in a cloth bag (starlings) or left in the live trap (rabbits and prairie dogs) and suspended in an asphyxiation cooler reserved for this purpose and containing enough dry ice or piped in carbon dioxide to produce an atmosphere rich in carbon dioxide. Alternatively, rabbits and prairie dogs may be dispatched with a pellet gun. Insects are to be dispatched by placing their collection container in the freezer.

Collected specimens must be prepared for shipment to the analytical laboratory. This involves selecting the particular tissues to be sampled, preparing the sample, and packaging the sample. While details of tissue selection and sample preparation are provided below for each species, a number of generalizations can be made.

Protocols for sample handling during preparation, packaging, transportation, and analysis are designed to prevent extraneous sample contamination. Samples can become contaminated during transport from the collection location to the preparation laboratory, during sample preparation, during sample transport to the analytical laboratory, and during laboratory analysis. The following measures shall be used to avoid extraneous sample contamination:

1. In handling the freshly collected sample, make sure your hands are clean or wear clean cotton gloves and put the sample in a clean cloth bag (prairie dog, rabbit, starling, deer mouse), or clean glass bottle (grasshoppers, beetles). Do not use plastic bags or rubber gloves. Have the gloves and bags washed by a commercial laundry between uses. In addition, have the insect nets washed between use at different sample sites, and decontaminate the Sherman traps and shovels (by washing in a trisodium phosphate [TSP] solution or other laboratory cleaner, rinsing, and air drying) between uses at different sample sites. Before new live traps and shovels are used the first time, they should be rinsed with hexane and then washed.

2. In preparing samples, wipe the sample preparation area with a TSP solution, rinse it with deionized water, and dry it with paper towel. To minimize the cleaning that is required, cover the cleaned preparation area with a clean square of cardboard before beginning to prepare a sample. Rinse all new metal equipment (e.g., scalpel blades, knives, etc.) with hexane, wash it with TSP solution, rinse with deionized water, and air-dry it before its first use. Subsequently, between specimens, this equipment needs only to be washed with a TSP solution, rinsed with deionized water, and air dried. Aluminum foil should be rinsed with hexane on the shiny side and folded into packets with the rinsed sides touching. Samples or clean equipment are then placed on the rinsed side. Unless glass bottles are precleaned by the laboratory, they should be washed with a TSP solution, rinsed, and air-dried before each use, including the initial use.

3. Clean tools must be available in the sample preparation area before each day's field effort. Used tools should be washed at the end of the day. Try to have enough clean equipment to prepare several specimens without washing. Wash all used equipment at once when you are through with sample preparation. Similarly, try to pre-rinse a quantity of aluminum foil so foil does not need to be prepared for each sample.

4. Keep debris from sample preparation in the plastic-lined garbage can in the sample preparation area. This waste material must be disposed on a <u>daily</u> basis.

Immediately after preparation, specimens in the form they are to be packaged and analyzed (e.g., gastrointestinal tracts are removed, feathers, beaks, and tarsi are removed, etc. as indicated below for the individual species) are weighed. Each sample should weigh at least 20 g. This will not be a problem for prairie dogs or rabbits, and probably not for starlings. The species-specific protocols regarding stipulations on weight for deer mice, grasshoppers, and beetles should be consulted for reference. Before specimens are weighed, a clean weighing paper, the glass bottle, or the hexane-rinsed packaging foil must be placed on the scale platform and tared. Weighed samples are then packaged in TSP-washed glass bottles or wrapped in two sheets of hexane-

rinsed extra-wide, heavy duty aluminum foil of an appropriate size. Packaged samples are then frozen for at least 24 hours before shipping. Shipping coolers should contain a minimum ratio of 1 pound dry ice per 3 pounds of frozen sample. A cooler should be moderately full prior to shipping. Shipping is the responsibility of the RMA Shipping Coordinator, who should be notified at least 1 day ahead of an intended shipment and the anticipated number and size of coolers. Because frozen samples will be placed in coolers that remain taped and under C-O-C protocols during shipment, extraneous sample contamination during shipping is not anticipated.

Protocols addressing prevention of extraneous sample contamination at the laboratory are addressed by the laboratory's QC plan. They are incorporated here by reference.

3.4 SPECIES-SPECIFIC PROCEDURES

3.4.1 Black-tailed Prairie Dog

Collection:

Black-tailed Prairie Dog (*Cynomys ludovicianus*)
Associated with bare 1- to 2-foot-high mounds on short-grass prairie; yellowish animal with terminal third of short tail black; ears small and belly pale buff or whitish. (White-tailed prairie dog: found in mountains, tail white.)

Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Late Spring/ Early Summer	Random locations within each of 50 AOD blocks and each of 30 blocks outside the AOD but inside the eagle exposure area	None on RMA	live trap or .22 rifle	Adult and Juvenile	Dressed carcass composed of whole prairie dog except for hair, skin, head, feet, and GI tract; the removed tissues (except the GI tract) should be saved as a separate sample identified by the same sample tag number (but with an R added)

- In the late spring, collect samples at the periphery of the AOD or eagle exposure area, preferentially collecting nondispersed 1-year-old juvenile females (that are not lactating) because they do not disperse in early spring. Therefore, they are less likely to have been exposed outside the AOD. Later in the season and in other areas, collect adults to minimize having samples that may have just moved to the collection location and that may still be growing (and therefore reflect growth dilution), and to maximize the time

period for collection. Collect adults only after young of the year are above ground and well grown.

- Obtain live traps from USFWS.

- Pre-bait locations where prairie dogs are to be trapped with alfalfa pellets for about 3 days before setting live traps.

- Use live traps to collect juveniles, so they can be checked for sex and breeding status. Collect nonlactating female juveniles. Female juveniles do not disperse in the spring as males do and should therefore be collected preferentially; yearling females occasionally breed, so check to ensure the female is not lactating before collecting it.

- Use live traps to collect adults if trapping is an effective and efficient means of collecting adults; if not, resort to firearms.

  Note: when firearms are being used, a USFWS staff member intends to accompany the collecting team; make sure you coordinate with USFWS to arrange a meeting place and time.

- When collecting with firearms and an appropriate juvenile cannot be collected in a block (i.e., not present, cannot be differentiated, or may have just moved in), collect an adult after trying for a reasonable amount of time to select and collect a juvenile.

- If appropriate prairie dog specimen is not present (or lost) within shooting range or a direction that is safe to shoot from the random starting location, walk toward the closest observable prairie dog aggregation; search within block until collection possibilities are exhausted.

- Minimize the likelihood of a shot specimen entering burrow. If the specimen is only wounded once it is shot or has been live trapped, place it in the asphyxiation cooler or dispatch it with a pellet gun.

- If specimen is lost down a burrow, collect a second specimen from same random location (if available).

- Record the shooting or trapping of any USFWS-tagged prairie dog (both of which are permitted) in your Field Notebook, including information on the tag, and make an extra copy of data pertinent to this specimen for USFWS.

  Note: Plague has been documented on RMA (winter 1988–89); take necessary precautions (taped sleeves, visual inspection) to prevent the fleas that are often on these prairie dogs from biting. While use of insect repellent is undesirable because of the

potential for sample contamination, the Element Manager is investigating the acceptability of various brands of repellant and protocols for their application. Check with the Element Manager before using any repellant.

Sample Preparation:

- Detailed procedures for skinning and performing a necropsy on a prairie dog are provided in Appendix A; following necropsy, the sample is comprised of a dressed carcass, which is defined as a whole prairie dog minus the head, skin, feet, and gastrointestinal tract.

- Save removed body parts (i.e., head, skin, and feet but not gastrointestinal tract) preparing them as a residual sample, i.e., appending an "R" to the original sample number (e.g., B0458R). (Since only 10 percent of the residual samples are to be analyzed, i.e., five specimens within the AOD and three specimens within the eagle exposure area, randomly select the blocks from which residual samples are to be saved before collecting the first prairie dog).

- Weigh samples.

Packaging Procedure:

- Double-wrap the sample with hexane-rinsed aluminum foil; fill out the sample tag and C-O-C form; tape sample tag on outside of sample; put C-O-C form into the envelope in the tray of the cooler in which samples are placed.

- Dispose of gastrointestinal tract in garbage can during day, transferring all refuse to the biota garbage can at end of day.

Recording Details:

- Record all general data.

- Record any unusual physical characteristics.

- Describe the soil type.

- Identify the block number.

- Indicate where the specimen was first observed and where it was ultimately collected (mark on map).

3.4.2 Rabbit

Collection:

Desert Cottontail (*Sylvilagus auduboni*)
Pale grayish washed with yellowish over much of the body; ears relatively large (3–4 in.). (Eastern cottontail: feet whitish, nape patch rusty and distinct, larger, but with 2.5–3 in. ears. Mountain cottontail usually not below pine zone in mountains.)

Eastern Cottontail (*Sylvilagus floridanus*)
Similar in general appearance to both desert and Nuttall's cottontails, but in general is larger, darker in color, and has relatively shorter ears than either of these species; patch on throat and chest bright rusty brownish (patch on desert cottontail described as orangish); see other comments under desert cottontail.

Black-tailed Jackrabbit (*Lepus californicus*)
Dorsal color grayish black and ventral color white. Black dorsal stripe extending from the tail onto rump; ears blackish on outer tips; Young have a pronounced white spot on the forehead (avoid these if possible); ears from about 100 to 130 mm; hind foot greater than 105 mm in adults; interparietal distinct and not fused to parietals (to distinguish from cottontails).

Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Late Spring/ Early Summer	Random locations within each of 20 blocks	None on RMA	.22 rifle; 12, 16, or 22 ga. shotgun, or live trap	Adult	Dressed carcass composed of whole cottontail except for hair, skin, head, feet, and GI tract; the tissues removed from the dressed carcasses (except the GI tract) should be saved as a separate sample identified by the same sample tag number but with an R added

- Collect either species of cottontail (desert or eastern) or black-tailed jackrabbit, whichever is encountered first; pool the results from both species to estimate risk to owls. The species that is actually collected should be identified on the FDF as can best be determined from external characteristics. Differentiation between desert and eastern cottontails is based on skull characteristics and ear measurements and is very difficult. Further, there could be a hybrid situation on RMA, since specimens from 1988 had ear lengths within the range of eastern cottontails, yet their skulls, when compared to the USFWS reference collection were like those of desert cottontails. Therefore, try to avoid shooting cottontails in the head; freeze the skull separately, tagging it with the same sample number and adding an "H" to indicate the sample is a head (e.g., B0458H).

- Initially, use live traps to collect rabbits, obtaining live traps from USFWS.

- Three days before the live traps are to be set, pre-bait the trap locations with alfalfa pellets. The traps should be left open over night and checked in the morning.

- If the live-trap method proves to be inefficient or ineffective, select either rifle or shotgun as the collecting method, depending on professional judgement regarding the most effective method in the habitat at the collection location.

- If an appropriate specimen is not present within shooting range or in a direction that is safe for shooting from the random collection location, or if an appropriate habitat is not present for trapping at the random collection location, walk toward closest observable appropriate habitat; search within block until the possibilities are exhausted.

- If the specimen is only wounded once it is shot or has been live trapped, place it in the asphyxiation cooler or dispatch it with a pellet gun.

Sample Preparation:

- Follow the detailed procedures for skinning and performing a necropsy on a cottontail/jackrabbit provided in Appendix A; following necropsy, the sample is comprised of a dressed carcass, which is defined as a whole cottontail/jackrabbit minus the head, skin, feet, and gastrointestinal tract.

- Save removed body parts (except GI tract), preparing them as a residual sample, i.e., appending an "R" to the original sample number (e.g., B0458R). (Since only 10 percent of the residual samples are to be analyzed, i.e., two from the AOD, randomly select the blocks from which samples are to be saved before collecting the first rabbit.)

- Weigh samples.

Packaging Procedure:

- Double-wrap the sample with hexane-rinsed aluminum foil; fill out the sample tag and C-O-C form; tape the sample tag on the outside of the sample; put the C-O-C form in the tray of the cooler in which samples are placed.

- Dispose of gastrointestinal tract in garbage can during day; transferring all refuse to the dedicated biota garbage can at end of the day.

Recording Details:

- Record all general data.

- Record any unusual physical characteristics.
- Identify the block number.
- Indicate where the specimen was first observed and where it was ultimately collected (mark on map).

3.4.3 Deer Mouse

Collection:

Deer Mouse (*Peromyscus maniculatus*)

Color ranges from pale grayish buff to deep reddish brown; tail is always sharply bicolor, white below, dark above. (Other likely species, based on range of occurrence, are northern grasshopper mouse with gray or pinkish cinnamon color above and white beneath, short fur, and short, white-tipped tail; house mouse with scaly, sparsely haired tail about same color above and below; plains and western harvest mice, which are small, brownish and similar to a house mouse, but with a distinct groove running down the length of the front teeth. This assumes that other rodent families such as the following will not be confused with the deer mouse: pocket gophers with external cheek pouches; exposed incisors; large curved front claws and a short tail sparsely covered with hair; pocket mice, kangaroo mice and kangaroo rats with fur-lined cheek pouches, weak front feet, strong and well-developed hind feet and legs, and tail as long as or longer than the head and body; voles with small ears, short tails, and a chunky build; and jumping mice with extremely long tails and large hind feet, but without external cheek pouches.)

Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Late Spring/ Early Summer	Random locations within each of 50 blocks	None on RMA	Sherman live trap	Adult; do not collect females that are obviously lactating	Whole bodies to provide at least a 20 g sample. If only individuals between 15 and 20 g are collected after two nights, collect two individuals (of the same sex if possible); prepare one as the sample with a "B" sample tag number; keep the other as an incipient sample with an "I" number. Individuals weighing less than 15 g will be released alive.

- Establish a five-trap by five-trap grid with 33-ft (10-m) spacing and the randomly selected starting location at one corner of the grid, but modify this protocol by professional judgment so that traps are placed in likely habitat and the grid remains within block boundaries; document any deviations from the protocol.

- Note that USFWS has ear-tagged some deer mice in areas marked on a map that will be in with the deer mouse maps; if the random starting location is in these USFWS trapping areas, select the second random starting coordinates; if an ear-tagged mouse is trapped anyway, do not collect it unless it is dead in the trap; provide USFWS with copies of all data pertinent to such a mouse, either trap/release and tag information for a released mouse, or a full data packet for a dead individual that was collected.

- As traps are checked, put the specimen and a tag including trap number into clean cloth bag. Since the goal is to sample individuals (i.e., one individual weighing at least 20 g per sample), do not dispatch the individuals in the bags until all traps have been checked and all individuals have been weighed with the Pesola scale. Save the heaviest mouse for the sample. If it weighs less than 20 g but more than 15 g, save a second individual of at least 15 g (and of the same sex if possible). Other mice should be released at the trap location where they were caught.

- Collect nonlactating individuals (to avoid known dilution of contaminant concentration by lactation, have sample type be as homogeneous as possible, and avoid unnecessary death of young).

- Weight of at least 15 g has precedence over lactation; therefore, if the only sample weighing at least 15 g is lactating, collect it anyway.

- Place the cloth bags containing the mice to be dispatched in the asphyxiation cooler; remove them from cloth bag before packaging. An alternative to this method is to squeeze just behind the head of the mouse (this can be done through the cloth bag) until the spinal column separates and/or the mouse asphyxiates. This eliminates the logistical difficulty of maintaining dry ice, but is more difficult to perform for some persons.

- If deer mice of sufficient weight (20 g) to be collected have not been trapped at the random sampling location after 2 nights, collect a lighter-weight specimen if it is at least 15 g, but also collect a second deer mouse as a reserve sample (same sex, if possible) from the location trapped.

- If no deer mice have been trapped at the random sampling location after 2 nights, move to a second randomly selected location within the block.

Sample Preparation:

- Follow the detailed procedures for performing a necropsy on a deer mouse provided in Appendix A; following necropsy, the sample is comprised of a whole body, which is defined as a whole deer mouse minus the gastrointestinal tract.

- Weigh sample.

Packaging Procedure:

- Double-wrap the sample with hexane-rinsed aluminum foil; fill out the sample tag and C-O-C form; tape the sample tag on outside of the sample; put C-O-C form into the envelope in the tray of the cooler in which samples are placed.

Recording Details:

- Record all general data.
- Record any unusual physical characteristics.
- Note weight, sex, and life stage.
- Describe the soil type.
- Identify the block number (mark location of trap grid on map).
- Identify the trap number where the mouse was collected (mark on grid map).

3.4.4 Starling

Collection:

Starling (*Sturnus vulgaris*)

Juveniles—On the back, a uniform dark olive-brown; below somewhat streaked with lighter markings at first, but soon become unicolor; white or buffy throat; after fall, they molt in synchrony with adults, cannot with certainty be distinguished from adults, although juveniles tend to have larger white tips to the feathers below.

Adults—Distinctive combination of black body and rather long, sharp, yellow bill; in the male, the base of the lower mandible is somewhat darkened with livid; in the female, these parts are simply paler yellow. After the fall molt in about mid-September, the feathers of the sides of the head, breast, flanks and underparts have white tips, so that from a distance the bird has a gray, mottled appearance. At close range, however, the dark parts of the feathers of the throat, breast, and flanks have iridescent reflections of purple, green, and blue; the back has green and bronze iridescence in brown-tipped feathers. During winter most of the white tips to the feathers on the breast and underparts wear off, leaving the bird dark below, with the iridescent reflections still present. About 8.5 inches long; weight about that of the robin, but the short drooping tail gives it, when at rest, a chunky, humpbacked appearance.

Verify adult association with nest box, if possible.

Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Nestlings–Summer, about 16 May to 21 June	Randomly selected nest boxes within each of the 5 group locations within the AOD	None	Obtain nestling from USFWS staff member within 1 hour of its removal from box by USFWS. Put nestling specimen into clean cloth bag and place in asphyxiation cooler; remove from cloth bag before packaging; alternatively, use cervical separation.	Nestlings just prior to fledgling	Dressed carcasses composed of a whole bird without feathers, beak, keratinized leg parts, and GI tract; the removed tissues (except the GI tract) should be saved as a separate sample identified by the same sample tag number but with an R added.

(If specific approval is given by USFWS for nestlings to be collected by a SFS-Phase I staff member, use the following technique. Approach nest box gently, but so as to make adult aware; watch for adult to leave nest box; rapidly place ladder, remove nestling, close box and leave with minimum disturbance.)

- Prior to sample collection, coordinate with USFWS to avoid interfering with their ongoing starling monitoring program and to arrange the time for nestling transfer.

- Starling collection assumes that the USFWS starling monitoring program investigator will tell field team members when nestlings are within 3 days of fledgling, after which time the USFWS staff member will collect the nestling within 1 to 2 days of fledgling and turn it over alive to the field team member within 1 hour of collection so that the field team member can dispatch, handle, and prepare the sample according to SFS-Phase I protocols.

- If there are fewer than 50 starlings available when collecting an equal number from each of the 5 group locations within the AOD, collect more individuals from one of the 3 group locations that are close to or marginally within the AOD, randomly picking which of the group locations to use and which of the additional active nests to sample.

- If active starling nests are absent from a group location, check with the USFWS starling monitoring program investigator once every week to see if active nests have been established.

Sample Preparation:

- Follow detailed procedures for performing a necropsy on a starling provided in Appendix A; following necropsy, the sample is comprised of a dressed carcass, which is defined as a whole starling minus the feathers, bill, tarsi, and gastrointestinal tract.

- Weigh sample.

Packaging Procedure:

- Double-wrap a sample with hexane-rinsed aluminum foil; fill out the sample tag and C-O-C form; tape the sample tag on the outside of the sample; put C-O-C form into the envelope in the tray of the cooler in which samples are placed.

- Save removed body parts (except gastrointestinal tract) preparing them as a residual sample, i.e., appending an "R" to the original sample number (e.g., B0458R). (Since only 10 percent of the residual samples are to be analyzed, i.e., five specimens within the AOD, randomly select the blocks from which residual samples are to be saved before collecting the first starling.)

- Weigh samples.

Recording Details:

- Record general data.
- Record any unusual physical characteristics.
- Identify group nest location.
- Identify nest box number.

3.4.5 Ground-Dwelling Beetle

Collection:

Ground-dwelling Beetle (Coleoptera) Collect all species of beetles that end up in the pit trap. These have a horny or leathery elytra and a head that is narrower than the rest of the body.					
Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Summer	Random locations within each of 25 blocks	None	Pit trap	All adults	Whole-body composite weighing a minimum of 20 g

- Embed new and shiny paint cans (which have slippery sides) flush with the ground surface. When in use, check the traps every 1 to 3 days unless it rains, in which case check them daily. When traps are not in use, put lids on the cans.
- Check pit traps for 3 consecutive days to determine an appropriate checking frequency that can be used thereafter.
- If after 2 weeks of checking a given trap location, a sufficient mass of beetles has still not been collected, begin collecting a supplementary sample (to composite with the first sample) from a location 200 ft from the first location within the block along a randomly selected compass line.
- Composite enough ground-dwelling beetles from a small geographic area within each assigned sampling location to provide 20 g of sample.

Sample Preparation:

- Weigh specimens in jar by subtracting the tare from the gross weight.

Packaging Procedure:

- Place a composite sample in glass bottle. If the full sample weight is not obtained on the first day of sampling, the sample should be considered incipient and given an "F" sample number. Continue adding mass from repeated checking of the trap until the sample weighs at least 20 g.

- If sample weight allows, save at least one voucher specimen of at least the major types of ground-dwelling beetle collected in an ethanol-filled container.

- Once an adequate number of specimens has been collected, identify and count the numbers of individuals representing each reasonably identifiable taxon in the sample; record this information in the Laboratory Notebook and its attachments, as appropriate.

- Weigh specimens in bottle by subtracting the tare from the gross weight.

- After sample taxa have been identified and weighed, fill out the sample tag and C-O-C from; tape the sample tag on the outside of the bottle and put the lid on; put C-O-C form into the envelope in the tray of the cooler in which samples are placed.

Recording Details:

- Record all general data.

- Record any unusual physical characteristics.

- Describe the soil type.

- If edging is used to funnel beetles toward trap, record the dimensions and sketch on map the area where the funnel was used to obtain sample.

- Note number of apparent taxa in sample.

- Note number of individuals in sample.

- Identify or describe any other type of animal caught in pit trap (e.g., shrew, deer mouse).

- Note reasonably identifiable taxa in sample.

- In notes section, describe identified taxa (e.g., color, patterns) so that basis for identification is apparent.

3.4.6 Grasshopper

Collection:

Grasshopper (Acrididae) Collect both species of short-horned and long-horned grasshoppers. Short-horned grasshoppers have short antennae and a broad, round face perpendicular to body. Long-horned grasshoppers have long antennae and a face that is often triangular and slanted with respect to the body axis.					
Collection					
Timing	Locations and Numbers	Coordination/ Permits	Method	Age	Tissue
Late Summer/ Early Fall	The same random locations within each of 25 blocks used to collect beetles	None	Sweep net along transects within a 100-ft (30-m) radius circle centered at the assigned sample location. Allow 3.3 ft (10 m) beyond location boundary for additional collection, if necessary.	Late instar nymphs (large, non-winged specimens), if possible	Whole-body composite weighing a minimum of 20 g

- Composite enough grasshoppers from a small geographic area within each assigned sampling location to provide 20 g of sample.

- If after 5, generally consecutive days of sweeping at a given sampling location, a sufficient mass of grasshoppers has still not been collected from within a 100-ft radius, expand the radius of the circle being swept to 200 ft.

Sample Preparation:

- Weigh specimens in bottle by subtracting the tare from the gross weight.

- As part of the packaging procedure only, remove the hind legs (if they are well hardened and spiny) so they will be present during taxonomic identification.

Packaging Procedure:

- Place a composite sample in glass bottle. If the sample weight is not obtained on the first day of sampling, the sample should be considered incipient and given an "I" number. Continue adding mass from repeated sweeping of the area until incipient sample weighs at least 20 grams.

- If sample weight allows, save at least one voucher specimen of at least the major types of grasshoppers collected in an ethanol-filled container.

- Once an adequate number of specimens has been collected, identify and count the numbers of individuals representing each reasonably identifiable taxon in the sample; record this information in the Laboratory Notebook and its attachments, as appropriate.

- Remove hind legs before packaging if they are well hardened and spiny.

- Weigh sample in bottle by subtracting the tare from the gross weight.

- After sample taxa have been identified and weighed, fill out the sample tag and C-O-C form; tape the sample tag on the outside of the jar and put the lid on; put the C-O-C form into the envelope in the tray of the cooler in which samples are placed.

- Dispose of hind legs in garbage can.

Recording Details:

- Record all general data.

- Record any unusual physical characteristics.

- Describe the soil type.

- Indicate the dimensions of the sweep area by sketching them directly on the map and noting them in the Field Notebook.

- Note the number of taxa in sample.

- Note the number of individuals in sample.

- Note reasonably identifiable taxa in sample.

- In notes section, describe identified taxa (e.g., color, patterns) so that basis for identification is apparent.

4.0 LABORATORY ANALYSIS PROGRAM

The contract analytical laboratory shall be responsible for documentation of their protocols for sample handling, identification, and tracking; protocols for quantifying the analytical parameters identified; and protocols for ensuring laboratory QA/QC. This information shall be provided by the laboratory in a QC plan. This plan is hereby incorporated by reference.

The contract analytical laboratory shall provide analytical results for nine organochlorine pesticides (OCPs), aldrin, dieldrin, endrin, DDT, DDE, alpha chlordane, gamma chlordane, oxychlordane, and heptachlorexpoxide, as well as percent lipid date for each sample. Further, the laboratory shall weigh the samples at the time they are homogenized and analyze them within 1 week of weighing.

Samples shall be prepared and extracted as per the existing PMRMA biota sampling methods. These methods primarily involve grinding the tissues with dry ice to obtain a homogenate followed by Soxhlet extraction and gas chromatography/electron capture detection (GC/ECD) analysis.

All sample homogenate remaining after an 8 g aliquot has been taken for OCP analysis shall be refrozen and saved. In addition, any sample extract remaining after analysis of the OCP aliquot shall be refrozen and saved. At the same time the SFS-Phase I decision process is applied (see Section 1), the need to analyze the remaining sample homogenate for mercury will be reevaluated if pertinent results from USFWS biota monitoring and any other new studies indicate that mercury is present in tissues at concentrations indicative of potential risk.

The final analytical method will be based upon EPA's SW-846 method 8081, which uses capillary megabore columns. The analytical method will incorporate second-column confirmation for positive identification of the COCs. The contract analytical laboratory, which is working to obtain method approval under standard USAEC protocols, has been given the following target reporting limits (TRLs) for the various analytes: aldrin, 0.002 micrograms per gram (μg/g);

dieldrin, 0.002 µg/g; endrin, 0.001 µg/g; DDT, 0.003 µg/g; DDE, 0.003 µg/g; and chlordane, 0.002 µg/g. The TRL for chlordane was set equal to that of aldrin and dieldrin because no other guidance was available. During certifications, the tested concentrations for establishing the certified reporting limits (CRLs) will range from 0.25 x TRL to 100 x TRL. Method reporting limits (MRLs) similar to CRLs or practical quantitation limits (PQLs) will be established for the method. In addition, a method detection limit (MDL) determination following EPA guidelines will be conducted at a factor of 5 to 10 times lower than the TRLs to ascertain a possible MDL.

Concentrations established as MRLs from the proficiency demonstration will be used as the lower reporting levels below which "less than" (LT) values will be reported. For those data points having values reported below the CRL (i.e., BCRL), the risk assessment will use proxy values. Alternative proxy approaches will be considered following the receipt of results from the contract analytical laboratory.

As proxy values for those data points reported below the CRL (i.e., BCRL), the risk assessment will use one-half the CRL, unless a more scientifically defensible method can be agreed upon by the EA Technical Subcommittee using criteria consistent with EPA guidance for selection of proxy values. Alternative approaches considered for determining proxy values will include robust methods, established EPA options for proxy values, and more sensitive analytical methods that would use the same sample extract as the original analysis.

Blind performance evaluation samples from the USFWS will be used to assess data quality and usability. These samples will be from the National Fisheries Contaminant Research Center in Columbia, Missouri, which will compare data from their prior analyses with the results of analyses by the SFS contract analytical laboratory. In addition, the contract analytical laboratory will run duplicate analyses on samples from 10 percent of the prairie dog and rabbit samples, which will be large enough to provide two analytical aliquots.

Quarterly audits of the contact analytical laboratory shall be conducted by PMRMA, accompanied by representatives of EBASCO and by representatives of Shell, EPA, USFWS, and CDH, if they so desire.

Further detail on the laboratory analysis program can be found in the laboratory quality control plan prepared by the contract analytical laboratory.

5.0 QUALITY ASSURANCE PROJECT PLAN

This section of the SAP constitutes the SFS-Phase I Quantity Assurance Project Plan (QAPP). The QAPP identifies and describes the QA/QC program elements integral to SFS-Phase I activities, thereby providing the framework and criteria that are necessary to establish a QA/QC program and to plan, implement, and assess the effectiveness of the data collection operations. The effective implementation of this QAPP and procedures derived from the QAMP will ensure that the data obtained under the SFS-Phase I are of the type and quantity appropriate for their intended use.

Information and requirements addressed in this QAPP are presented in Sections 5.1 and 5.2, but are cross-referenced throughout to Part A and Part B, respectively, of the Quality Assurance Management Plan (QAMP) (EBASCO 1993), which this QAPP incorporates by reference and by consistency in application. Section 5.1 (Part A) contains management system elements applicable to environmental programs. Section 5.2 (Part B) contains those elements for the generation, collection, analysis, evaluation, and reporting of data.

5.1 PART A: MANAGEMENT SYSTEM PROGRAM ELEMENTS

This section presents quality management functions and identifies the specific QA/QC activities that allow the SFS-Phase I to be effectively planned, implemented, and assessed. The program elements discussed herein are used in conjunction with the other sections of this plan and the QAMP to form a complete task-specific quality program. Program elements discussed in this section include the following:

- A-1: Program Organization and Responsibilities
- A-2: Quality Assurance Program Description
- A-3: Personnel Training and Qualifications
- A-4: Management Assessment
- A-5: Procurement of Items and Services
- A-6: Document Control and Records

- A-7: Computer Hardware and Software
- A-8: Work Processes and Operations

5.1.1 A-1: Program Organization and Responsibilities

This section describes the organization, responsibilities, and authorities for the development, implementation, and assessment of the QAPP under the SFS-Phase I. The specific roles with responsibilities and authorities related to the SFS-Phase I outside those described in Part A, Section A-1 of the QAMP are discussed below. The individuals who will fill these roles are identified in Appendix E. The responsibilities and authorities of the Program Manager and QA Manager are discussed in the QAMP.

5.1.1.1 Element Manager

The Element Manager is responsible for the overall management of the SFS-Phase I. The Element Manager reports directly to the RMA Endangerment Assessment Task Manager. Specifically, the Element Manager's responsibilities include the following:

- Directing the task team.
- Making task-specific work assignments.
- Approving task-specific work plans.
- Directing staff in the implementation of work assignments.
- Approving and submitting task reports.
- Maintaining task budget and schedule compliance.
- Serving as primary task representative for RMA EA Technical Subcommittee (also RMA Committee and Council if requested by PMRMA).
- Reviewing all written correspondence on the SFS before it is sent to outside recipients.

5.1.1.2 Technical Lead

The Technical Lead is primarily responsible for directing the technical aspects of the SFS. The Technical Lead is also to function as the Field QC Manager and to provide management support for the field activity component of the SFS-Phase I for the Element Manager. The Technical Lead reports directly to the Element Manager. Specifically, the Technical Lead's responsibilities include the following:

- Ensuring the technical competence of the SFS-Phase I planning documents (SAP, HASP, QAPP) and the SFS-Phase I Report, as well as ensuring the compliance of these documents with the SFS-Phase I Plan approved by the RMA EA Technical Subcommittee.
- Ensuring the field activities comply with the DQOs specified in the SFS-Phase I Plan and SAP.
- Working with the Field Coordinator to ensure that the field crews are following proper collection procedures and complying with GLP.
- Recommending personnel to complete appropriate calculation procedures.
- Working with the Army and Organizations and State to resolve field activity problems (e.g., sampling limitations).
- Recommending and coordinating modifications to the work plans with appropriate personnel.
- Informing the Element Manager of weekly activities.
- Serving as technical representative for all RMA EA Technical Subcommittee Meetings and other technical meetings as identified by the Element Manager.
- Ensuring the technical competence of the draft and final SFS-Phase I reports.

5.1.1.3 Field Coordinator

The Field Coordinator has direct responsibility for the day-to-day operations of the field collection crews. The Field Coordinator reports directly to the Technical Lead on technical issues and the Element Manager for all staffing needs. Specifically, the Field Coordinator's responsibilities include the following:

- Working through the Technical Lead to ensure the collection activities are adequately staffed and supplied.

- Preparing the daily sampling logistic plans and reviewing the plans with field crews.

- Working with the Technical Lead to ensure that the field crews are following the sampling logistic plans, proper collection procedures, and GLP.

- Communicating directly with the Technical Lead when problems are encountered in the field that may compromise the DQOs.

- Informing USFWS of collection activities and coordinating all collections through the Arsenal Activities Coordination (AAC) program by attending the AAC Tuesday morning coordination meetings.

- Preparing the field activity section of the draft and final reports.

5.1.1.4 Field Team

The field team members provide collection support as directed by the Field Coordinator. Specifically, their responsibilities include the following:

- Complying with the Field Coordinator's requests.

- Following the sampling protocol and data entry requirements precisely as specified in the SAP and QAPP.

- Complying with the HASP for their safety and that of others.

- Referring all questions from those not directly involved with the SFS-Phase I to the Field Coordinator.

- Ensuring proper maintenance of all sample collection equipment.

- Completing data entry requirements on a daily basis as directed by the Technical Lead.

- Assisting with the preparation of the draft and final report document as needed.

5.1.1.5 Statistical Lead

The Statistical Lead works closely with the Technical Lead and has the following responsibilities:

- Selecting the sample locations following the protocol approved by the RMA EA Technical Subcommittee as specified in the SFS-Phase I Plan.
- Working with the Technical Lead to help resolve any problems related to the inability to execute the statistical sample design because of biological conditions.
- Processing the analytical data according to the decision process specified in the SFS design document and coordinating the results with the technical lead.
- Preparing the statistical write-up for the draft and final report document.

5.1.2 A-2: Quality Assurance Program Description

The QAMP was written to address the general QA requirements common to all activities under EBASCO's basic contract with PMRMA. The content of the QAMP was driven by the basic contract and the PMRMA Chemical Quality Assurance Plan (CQAP). The format of the QAMP was selected based on discussions with PMRMA, and is consistent with the American National Standards Institute/American Society for Quality Control (ANSI/ASQC) E-4. As a supplement to the QAMP, this QAPP addresses additional and site-specific QA controls and requirements that are applicable to the SFS-Phase I. The elements contained in the QAPP are further addressed in the corresponding sections of the QAMP.

5.1.3 A-3: Personnel Training and Qualifications

All training shall be consistent with the requirements of Part A, Section A-3 of the QAMP and this section of the QAPP to ensure that SFS-Phase I personnel and any subcontractor personnel are trained and qualified to perform assigned task activities. Training for the SFS-Phase I consists of training to the requirements of the SAP and associated standard operating procedures (SOPs), the QAMP, QAPP, and the APSTP. Training shall be completed and documented prior to the start of field activities as specified in Section 3.2, and all training records shall be maintained in the QA files in accordance with Section A-6 of the QAMP. Documentation of current personnel health and safety qualifications and training shall be maintained in the

EBASCO Regional Health and Safety files, which are located in the Denver office. Health and safety qualifications and training requirements specific to one or more roles in SFS-Phase I field activities contained in Section 2.0 of the APSTP are listed below:

- 40-hour Health and Safety Training for Hazardous Waste Workers
- 8-hour Annual Hazardous Waste Worker Refresher Training
- 8-hour Supervisory Training for Hazardous Waste Operations
- 24-hour On-The-Job Supervision for Hazardous Waste Workers
- Site-Specific Training for Site Workers
- Hazard Communication Training
- Respiratory Protection Training
- First Aid/Cardiopulmonary Resuscitation Training

5.1.4 A-4: Management Assessment

EBASCO management regularly assesses the adequacy of the framework and infrastructure of the QAPP and ensures its effective implementation. While specific QA/QC activities may be delegated, the Program Manager may not delegate overall responsibility for ensuring that an effective QAPP has been established, implemented, and followed. All assessment activities shall be performed to comply with the requirements of the QAPP and Part A, Section A-4 of the QAMP. Additionally, the QA Manager or his or her designee shall conduct twice-monthly field assessments and two field audits, as is discussed in Section 5.2.5 (B-5) of this QAPP.

5.1.5 A-5: Procurement of Items and Services

This section of the QAPP defines a management system to ensure that procurement processes are documented and controlled, and that procured items and services conform to established requirements. The Project Procurement Liaison is responsible for control of procurement documents and adherence to the contract procurement requirements. The Project Procurement Liaison secures replacement or remedy of deficient items or services.

The Technical Lead is responsible for identifying quality-affecting items and services to the Project Procurement Liaison and the QA Manager and for monitoring the quality of items and services provided by suppliers in support of work activities. The Technical Lead provides the Project Procurement Liaison with appropriate specifications, scope of work, and other documentation necessary to obtain acceptable items and services.

5.1.6 A-6: Document Control and Records

Documents developed to prescribe the SFS-Phase I activities shall be identified, prepared, reviewed, approved, used, and controlled according to the requirements of the QAMP. Accordingly, the following documents are to be controlled:

- Supplemental Field Study Sampling and Analysis Plan, including the Quality Assurance Project Plan and the Data Management Plan
- Accident Prevention Safety Program Plan

Copies of each of these documents shall be maintained by each sampling team (in the field vehicle), by the Field Coordinator in the laboratory, and in EBASCO's Denver office.

Field records are considered QA records and shall be controlled in accordance with Section A-6 of the QAMP. SFS-Phase I documentation necessitating QA control includes, but is not limited to, the following.

- Field Notebooks
- Laboratory Notebook (with attached Necropsy and Insect Taxonomy Data Sheets)
- Field Data Forms
- C-O-C Forms and Airbills
- Sampling and Analysis Plan
- Accident Prevention Safety Program Plan
- Audit/Surveillance Reports

- Nonconformance Reports
- Corrective Action Reports
- Data Validation Results

5.1.7 A-7: Computer Hardware and Software

This section of the QAPP addresses task-specific requirements for computer hardware and software. Computer software to be used in support of the SFS-Phase I includes the following:

- Microsoft Excel
- Microsoft Word
- Windows
- WordPerfect
- dBASE

Other computer software development, validation, and verification shall be in accordance with the requirements of Part A, Section A-7 of the QAMP and internal EBASCO procedures.

Computer programs shall be checked against known solutions to verify that answers obtained yield valid results. The known solutions used shall include samples throughout the range of possible solutions to ensure the program's integrity and accuracy. Moreover, the computer programs shall be verified to ensure that they are being applied properly with respect to the analyses being undertaken.

The results of the verification testing described above shall be documented and maintained in the QA files as appropriate.

5.1.8 A-8: Work Processes and Operations

Work activities conducted by the EBASCO SFS-Phase I personnel and any subcontractor personnel for the SFS-Phase I shall be planned, implemented, and assessed in accordance with Part A, Section A-8 of the QAMP.

Work processes applicable to the SFS-Phase I are defined in the following planning documents:

- Quality Assurance Management Plan
- Accident Prevention Safety Task Plan
- Supplemental Field Study – Sampling and Analysis Plan (including the Quality Assurance Project Plan and the Data Management Plan)

5.2 PART B: CHARACTERIZATION OF ENVIRONMENTAL PROCESSES AND CONDITIONS

This section of the QAPP contains the QA requirements applicable to activities needed to plan, implement, and assess environmental data operations to ensure that results meet the needs of the data user. Environmental data operations include the collection and analysis of data from existing databases and the generation and analysis of field sample data obtained in support of task activities. The basic quality program elements discussed in this section include the following:

- B-1: Planning and Scope
- B-2: Data Collection Design
- B-3: Implementation of Planned Operations
- B-4: Assessment of Data Usability
- B-5: Quality Assessment and Response

Section 5.2 (Part B) requirements are used in conjunction with those contained in Section 5.1 (Part A) to implement the data collection and analysis activities described in the SFS-Phase I Plan (EBASCO 1994a) and the SAP. All individuals performing work affecting the overall

quality of work on the SFS-Phase I shall comply with the requirements of this QAPP and subordinate procedures and documents.

5.2.1 B-1: Planning and Scope

Activities regarding the acquisition, generation, and use of data collected during the SFS-Phase I are planned and documented by the Element Manager, Technical Lead, and Statistical Lead. The requirements for analytical data are presented in Section 3.0 of the PMRMA Chemical Quality Assurance Program (CQAP) manual, including supplements, the SFS-Phase I Plan (EBASCO 1994a), and this SAP.

5.2.2 B-2: Data Collection Design

5.2.2.1 Data Quality Objectives

The data quality objectives (DQOs) for the SFS-Phase I are discussed in Section 1.2, which references their more complete discussion in the SFS-Phase I Plan (EBASCO 1994a). Achievement of the DQOs is determined by evaluation of the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. The PARCC parameters are quantitative and qualitative statements of the quality of the data. The objectives for the PARCC parameters are discussed below.

Analytical precision and accuracy are determined during and as a result of the method certification as discussed in the PMRMA CQAP. Data not meeting accuracy and precision requirements as determined by the PMRMA Laboratory Support Division (LSD) review shall be qualified as to its usability.

The analytical methods used to generate data of the necessary quality for the SFS-Phase I are presented in Section 4.0 and detailed in the contract analytical laboratory's QC plan. Tissue analysis is to be conducted for OCPs only. CRLs (MRL and MDL) are to be determined during the certification process (see Section 5).

Representativeness is achieved for the SFS-Phase I through the development of the SAP and the SOPs. The SOPs utilized for the SFS-Phase I are listed in Section 5.2.2.3.

Data comparability is achieved by utilization of standard certified methods and approved sampling procedures. The analytical method used for OCP analysis is to be based on EPA SW-846.

The target for data completeness is 100 percent. This completeness target is subject to the validation of data and the assessment of data usability.

5.2.2.2 Sample and Document Custody Procedures

General procedures consistent with the requirements contained within the QAMP were developed to meet the specific requirements of the SFS-Phase I. These procedures, presented in Section 3, include the following:

- Data recording for field notebooks, sample tags, FDFs, and C-O-C forms
- Sample handling procedures for preparation, packaging, and transportation of samples

Detailed discussion of sample and document custody procedures are contained in the QAMP. The sample tag and C-O-C form prepared to meet the specific requirements of the SFS-Phase I are presented in Figures 3-1 and 3-2, respectively.

The C-O-C form for the SFS-Phase I shall be completed when a sufficient amount of a specific tissue is collected. Any tissue collected prior to completion of the sampling shall be maintained under custody of the sampler until the C-O-C form is completed (see Section 3.3.3.3). Documentation of all sampling shall be maintained in the field logbooks and transferred to the FDFs.

The QA Manager or designee will review all field documentation, including FDFs, C-O-C forms, and data notebooks for completeness and accuracy (see Section 3.3.3). The EBASCO QA Group will also verify all computer-generated entered data against the field notes.

All data notebooks shall be assigned a six-digit alphanumeric identification number. The identification number for the SFS-Phase I will start with SFS-001, where SFS denotes the task and 001 is the first notebook in the sequence assigned to the task.

Data notebooks are to be issued to appropriate personnel and information regarding issuance is to be recorded in the Document Control Logbook maintained by the QA Manager. The Document Control logbook shall contain, at a minimum, the following information:

- Issue date
- Person to whom the notebook is issued
- Project name and number
- QC Representative's name
- Return date of the notebook

Field files shall be maintained during the conduct of SFS-Phase I field activities and shall contain the following for each sample collected:

- Field Logbook Notes
- Field Data Forms
- Collection Location Maps
- Chain-of-Custody Forms
- Airbills

A field file checkoff list containing the items listed above shall be used to ensure that all information is properly filed. This list shall include a line item indicating the date the record was placed in the file and the personnel responsible for the filing. Each field file shall be completed by the end of the day that the sample is shipped to the laboratory.

It is the responsibility of the Field Coordinator to ensure that all field files are completed as discussed above. All field files shall be transmitted the QA Manager for review as discussed in Section 3.3.3. After the QA review and any corrections necessitated by the review have been completed, the field files will be transferred to the project files as documentation and for subsequent use.

5.2.2.3 Sampling Procedures

Field sampling procedures shall be conducted in accordance with the requirements contained in Part B, Section B-2 of the QAMP. Field sampling procedures developed for the SFS-Phase I are presented in Section 3.4 and include species-specific collection, preparation, packaging, and recording procedures for the following:

- Black-tailed prairie dog
- Rabbit
- Deer mouse
- Starling
- Ground-dwelling beetle
- Grasshopper

Sample handling procedures shall be conducted in accordance with Sections 3.3.4 and 3.4 and include the following activities:

- Sample collection

- Sample preparation
- Sample packaging

5.2.2.4 Analytical Procedures

The laboratory analytical procedure shall be in accordance with the requirements presented in Section 4.0, and in Part B, Section B-2 of the QAMP and the PMRMA CQAP, and shall be based on the EPA method for analysis of OCPs as certified for the biota matrix by the PMRMA LSD. Laboratory sample tracking, documentation, and reporting procedures are specified in the PMRMA CQAP manual. Laboratory operating procedures applicable to this program are contained within the contract analytical laboratory's QC plan.

5.2.2.5 Calibration Procedures and Frequency

The control of measuring and test equipment and calibration shall be in accordance with Part B, Section B-2 of the QAMP. The instruments that must be calibrated under the SFS-Phase I include laboratory analytical equipment and the scales used to weigh samples.

Calibration frequencies are specified in SOPs associated with the specific instruments employed. Calibration of laboratory analytical equipment is discussed in the contract analytical laboratory's QC plan.

Preventive maintenance procedures and schedules for the analytical equipment are contained in the contract analytical laboratory's QC plan.

5.2.3 B-3: Implementation of Planned Operations

Implementation of planned operations under the SFS-Phase I, including data collection operations, shall be performed according to the overall SAP, this QAPP component of the SAP, Part B, Section B-3 of the QAMP, and the SFS-Phase I Plan, and supporting procedures. The SOPs contain the specific information used to execute the decisions and results of the planning function.

The internal QC checks for field activities performed under the SFS-Phase I shall be conducted in accordance with the Part B, Section B-3 of the QAMP. The type of field QC samples and the collection frequencies shall be as defined below:

- Duplicate Samples—Field sample splits on 10 percent of the appropriate species and tissue shall be collected. The duplicate samples are used to assess the sampling precision. The sampling precision is evaluated by calculating the relative percent difference (RPD) between the environmental sample and the duplicate. An RPD value of ± 35 percent will be considered acceptable for values five times the CRL. For values less than five times the CRL, the control limits will be established at plus or minus two times the CRL.

- Laboratory internal QC checks shall be conducted by analyzing method blanks and spikes in accordance with the PMRMA CQAP. For OCP analysis, second-column confirmation shall be conducted using a dissimilar column. Alternatively, GC/MS confirmation can be performed, if the analyte concentration is high enough.

In addition to the analysis of internal QC samples discussed above, the contract analytical laboratory shall analyze blind performance evaluation samples provided by USFWS. These samples will be used to assess the laboratory data quality and usability.

5.2.4 B-4: Assessment of Data Usability

The field data obtained from the SFS-Phase I shall be qualified according to the intended use of the data, and shall be assessed in accordance with Part B, Section B-4 of the QAMP, including data reduction, validation, and reporting activities, as described below.

Sampling data shall be collected by field samplers and recorded in the data notebooks (Section 3.3.3). The Field Logbook serves as a record of the day's activities and must include such information as the team members' names, activity start and end time, the sampling activity, the location of the work, species being sampled, and general observations. Each page of the logbook shall be sequentially numbered with the logbook number and page number, dated, and initialled. Entries in the Field Notebook concerning photographs (if photographs are taken) must include such information as the photographer's name, date, time, roll number, frame number, and location as well as the subjects of all the photographs.

Sampling information shall be transferred into the computer program from the Field Notebook and Laboratory Logbook by an appropriate field team member. The information that is required as appropriate for entry into the database is discussed in Section 3.3.3. For a given sample, all data shall be entered into the database by one person and shall be checked by a different person to ensure that the information has been completely and accurately transferred to the form. Any errors noted by the checker shall be resolved by the sampler and the database corrected.

Once the data entries have been verified, an FDF, C-O-C form, and sample tag shall be generated as documentation of the sampling. Once these forms are printed, any subsequent corrections must be done by hand on hard copy, i.e., drawing a single line through an incorrect entry, writing in the correct entry, and initialing the change. FDFs, C-O-C forms, and sample tags generated for a completed sample remain with the sample and are treated as discussed in Section 3.3.3.3. If composite samples (i.e., for beetles and grasshoppers) are not complete on the first day of sampling, the FDF, C-O-C form, and sample tag are generated with the first partial sample and kept with the glass collection bottle. Subsequent partial samples collected from the same location are to be weighed and placed in the same glass collection bottle, and their date, time of collection, and weight added by hand to the FDF. Once the minimum sample weight is reached, the final ("B") sample tag number is written by hand on each form and the incipient ("F") sample number crossed off and initialed. Each FDF must be signed by the sampler, and the checker must sign the upper right corner of the form to indicate that the information contained on the form accurately represents information contained in the Field Notebook and Laboratory Logbook.

Copies of the Field Notebook pages, FDF, and C-O-C form shall be placed in the field file along with other required documentation specified in Section 5.2.2 (B-2). A copy of each C-O-C form shall be transmitted to D.P. Associates within 24 hours of shipping the samples.

Laboratory data obtained under the SFS-Phase I shall be reduced and verified according to specific laboratory procedures and transmitted to D.P. Associates. D.P. Associates is to provide a copy of the data to EBASCO to verify the following:

- Site type and site identification
- Identification of duplicates
- Identification and evaluation of matrix spike/matrix spike duplicate samples

The laboratory shall provide a monthly QC report to PMRMA LSD that includes information on documentation of QC measures taken, data quality indicator calculations, interpretation of calculated results, and any corrective action taken with appropriate explanations.

Approval of data based on review of QC data and control charts shall be conducted by PMRMA LSD. Control charts are to be maintained for both precision and accuracy. Accuracy of each of the methods is calculated by dividing the known spike value by the found spike value. Precision is calculated by determining the relative standard deviation of the spike results. Method accuracy and precision control limits are determined during the certification of the method. Section 4.0 provides further information on the laboratory analysis program, as does the contract analytical laboratory's QC plan.

IRDMIS group and record checks shall be performed by D.P. Associates. Group checks are performed to ascertain whether corresponding map records exist and to ascertain whether both the individual records and the associated group of data are acceptable. Record checks are performed to verify the format of individual records and to adjust the analytical data for dilutions, moisture, and for the accuracy of the method as determined from the laboratory certification data. Section 6.0 provides further information on the data management program.

5.2.5 B-5: Quality Assessment and Response

Activities performed during the SFS-Phase I sampling program shall be regularly assessed to ensure that the requirements are in accordance with the SAP and other planning documents. Quality surveillances and audits shall be performed in accordance with Part B, Section B-5 of the QAMP. A surveillance is the act of monitoring or observing an activity to verify

conformance to specified requirements. An audit is a planned and documented investigation and evaluation of a process to determine its compliance with established procedures and instructions.

For the SFS-Phase I, field surveillances shall be conducted by the QA Manager or his or her designee twice a month during the field program to monitor implementation of and adherence to the SAP procedures. Deviations from SAP protocols observed during the field surveillances shall be brought to the immediate attention of the field samplers, Field Coordinator, and Technical Lead. In addition, a summary report shall be provided to the Element Manager, Technical Lead, and Field Coordinator. Two field audits shall be conducted during the field activities to assess compliance with SFS-Phase I plans and procedures. All nonconformances, findings, and observations shall be documented and reported to the Program and Task Managers for resolution. Corrective Action Procedures are discussed in the QAMP. Any deficiencies noted during surveillance or audit activities or by project personnel will be documented and rectified or justified using a Field Protocol Deviation Form (Appendix D).

The QA Manager or his or her designee shall be present at all field audits conducted by PMRMA. All such field surveillance and audit reports shall be conducted as described in the QAMP. The QA Manager or his or her designee and an EBASCO chemist shall also attend each laboratory audit conducted by PMRMA to review data packages pertinent to the task.

6.0 DATA MANAGEMENT PROGRAM

General data management procedures that apply to all phases of the SFS-Phase I are addressed in the basic contract. This section deals with the procedures specific to the management of biota sampling data generated pursuant to the SFS-Phase I objectives and serves as the project-specific Data Management Plan (DMP).

Two types of data are to be received from the SFS-Phase I: (1) information collected in the field regarding the location and environment of the organism collected, as well as that information regarding the procurement and necropsy of the tissue comprising the sample, and (2) results from the contract analytical laboratory regarding the chemical and lipid analysis and the weighing of the samples prior to homogenization.

The first type of data is to be recorded in data notebooks and on FDFs, C-O-C forms, and sample tags as is described in Section 3.3. The electronic versions of the data that are entered into the laboratory computer (i.e., FDFs, C-O-C forms, and sample tags) will be given to the Project Data Manager and maintained in a Biota Data Management System (BDMS). The FDF data, in particular, will be used in subsequent data analysis and interpretation since these data provide the biological information associated with the chemical data from a particular sample. The data on tissue concentrations of contaminants are to be entered into the IRDMIS system by the contract analytical laboratory and provided to EBASCO via DP. The way in which both field and chemical data in electronic form will be managed by the Project Data Manager is discussed below.

6.1 MANAGEMENT OF ELECTRONIC FIELD DATA ON BIOTA

The biological data on samples collected for chemical analyses are to be recorded on FDFs that are generated in the field using custom-designed software on a portable laptop computer. These data are entered, verified, and stored in electronic database format and the FDFs are generated in the field using BIOTACOC. The system provides for one-time electronic capture of data, data queries, and reports. Electronic transfer files of BIOTACOC data are to be transmitted or

delivered to the Project Data Manager once each week. The Project Data Manager shall establish a database for the BIOTACOC data that will be used to support the analysis of SFS field data.

6.2 MANAGEMENT OF ELECTRONIC CHEMICAL DATA ON BIOTA

The SFS-Phase I will be conducted under the direction of PMRMA. DP maintains all data collected from this and other sampling programs on a Digital Equipment Corporation VAX 5900 computer located at RMA. The Data Coordinator at PMRMA is responsible for all IRDMIS data entry, data validation, formatting of files, and submittal of files to DP. The role of the Project Data Manager is to track data from initial sampling to the final uploading into the RMA Environmental Database, ensuring that data are received at DP in a timely manner and providing standard contract electronic data deliverables (i.e., project management information). Personnel assigned to these roles and information on how to contact them is provided in Appendix E.

6.2.1 Data Management System

The Project Data Manager shall be responsible for all the requirements of this DMP and the observance of applicable procedures from the existing PMRMA Data Management System (Figure 6-1). Additionally, the Project Data Manager shall be responsible for all data submitted to the PMRMA Environmental Database and for satisfying contract electronic data deliverables.

To computerize sampling plans, the EBASCO Data Management Group developed Sample Planner, a software application for soil, sediment, and water data that prints C-O-C forms and sample tags and creates a transfer file of the sampling plan for automated uploading into the Sample Tracking System. The BIOTACOC software application is currently separate from Sample Planner, but will be integrated with Sample Planner to use the latter's transfer-file capabilities.

Analytical results shall be entered, verified, and submitted to DP by contract analytical laboratory personnel using PC-based IRDMIS and under PMRMA supervision. DP submits a copy of the analytical results to the Project Data Manager for site identifier QC and for electronic uploading

into the EBASCO Data Tracking System. The Project Data Manager enters and tracks all samples in the Sample Tracking System to ensure data are received at DP in a timely manner. Tickler reports are to be submitted to PMRMA, reporting data that have not been received according to contract electronic data deliverable schedules.

The contract electronic data deliverables shall be entered using the Project Management Information and Mapfile/Well info entry programs supplied from PMRMA by DP. These data shall be entered, verified, and submitted to DP by the Project Data Manager.

Data integrity is essential and shall be maintained at all times. Data must not be altered at any time for any reason other than to correct data entry errors. The DP data corrections procedures for the litigation and audit requirements placed on the RMA Environmental Database shall be followed for any corrections made to any data under the SFS-Phase I.

6.2.2 Types of Data

Two types of SFS-Phase I data will be provided by the Project Data Manager to DP: Project Management Information and Mapfile information. The elements of the database files for these categories are briefly described here, along with their corresponding data components.

6.2.2.1 Project Management Information

The Project Management Information file is used to supplement analytical data collected with specific contract, task, and project data for a particular sampling program. Additional descriptive information or comments about the analytical data can be entered in this file for future reference.

The fields for the Project Management Information file are as follows:

- Field Sample Number—An eight-character alphanumeric code assigned by the sampling team used to identify the field sample tag number.
- Organization Code—A two-character alphanumeric field used to designate the organization performing the sampling.

- Contract Number—A 20-character alphanumeric field used to store the contract number for the sampling program.

- Task Number—A 10-character alphanumeric field used to store the task number.

- Delivery Order Number—A 15-character alphanumeric field used to store the delivery order number of the current sampling event.

- User Defined 1—A 10-character alphanumeric field used to store in-house management information.

- User Defined 2—A 10-character alphanumeric field used to store in-house management information.

- Comments—A 25-character alphanumeric field used to store any additional comments deemed necessary.

6.2.2.2 Mapfile Information

Information regarding the location and elevation of each sampling point shall be coded, entered, and submitted using the mapfile data entry coding forms and programs. The mapfile coordinate measurements have been standardized to STP units. The STP coordinate system measures (in ft) the north-south distance and the east-west distance of a sampling point relative to the north zone of the three-zone Colorado STP coordinate system. Currently, North American Datum 27 is being used.

The fields for the Mapfile are as follows:

- Site Type—A four-character alphanumeric field used to identify the type of site from which the sample was taken. The only allowable site type is "BIOL."

- Site ID—A 10-character alphanumeric field that provides information about the sample collection location. Section 3.3.3.1 describes the development of the Site ID.

- Location Description—A two-character alphanumeric field used to identify the location description sequence number. Acceptable entries are "PT" or the number 01 through 99. (This field is not pertinent to biota collection and will be left blank.)

- Point Type—A four-character alphanumeric field used to designate another site that is related to the site (e.g., a borehole in which a well was constructed) and is used in conjunction with the Point ID. (This field is not pertinent to biota collection and will be left blank.)

- Point ID—A 10-character alphanumeric field used to designate another site that is related to the Site ID (e.g., a borehole in which a well was constructed) and is used in conjunction with the Point Type. (This field is not pertinent to biota collection and will be left blank.)

- Easting (X)—The X coordinate of the sampling point, commonly referred to as the "Easting." It can be up to seven numeric characters in length and is recorded in ft for STP measurements.

- Northing (Y)—The Y coordinate of the sampling point, commonly referred to as the "Northing." It can be up to six numeric characters in length and is recorded in ft for STP measurements.

- Information Source—A one-character alphanumeric field code that identifies the source of the coordinate and elevation data.

- Information Exponent—A one-character numeric code that indicates the accuracy of the measurement. Acceptable entries are as follows:

  —0, or accurate to the nearest 1 m (i.e., 3.3 ft)
  —1, or accurate to the nearest 10 m (i.e., 33 ft)
  —2, or accurate to the nearest 100 m (i.e., 330 ft)
  —3, or accurate to the nearest 1000 m (i.e., 3300 ft)

Coordinate and elevation information is read from a map; an Information Exponent code of 1 will be used since the sample collection coordinates (Fx, Fy) are to be surveyed to $\leq \pm$ 16 ft (5 m).

- Survey Date—The Gregorian date when the measurement was taken in month/day/year format.

- Description—A 20-character alphanumeric field used to hold narrative text or comments.

6.2.3 Flow of Data

The flow of data during the SFS-Phase I shall be conducted as follows. Data entry and the initial stages of data validation are conducted on IBM-compatible personal computers through the use of the PC-based IRDMIS. The contract analytical laboratory is responsible for conducting the data entry, verifying data, and preparing transfer files to be submitted to DP. Analytical data are then sent to the Project Data Manager for QC checks and uploading into the EBASCO Data Tracking System. The SFS-Phase I personnel are responsible for providing mapfile data in electronic format to the Project Data Manager, who verifies the mapfile data and submits it to DP for uploading. Monthly Tickler reports from the EBASCO Data Tracking System are submitted to PMRMA showing analytical data that are past due from the contract analytical laboratory.

6.2.3.1 Data Tracking

As a result of past and current RMA projects, an approach has been developed that integrates the requirements of the IRDMIS with the EBASCO protocols for quality control of analytical data. This approach applies to all program aspects from data collection and analysis to report preparation. For the SFS-Phase I, a computerized data management system is to be used that tracks data from the field through the steps outlined in this document and ensures completion of all data contract requirements in a timely manner.

EBASCO's analytical data-tracking system provides a means to track sample data from the date of sampling through analysis, to submittal of data to DP, and uploading into the RMA Environmental Database. In this system, field samples are lotted into appropriate analytical fractions upon receipt by the contract analytical laboratory, and transfer of the analytical results from the laboratory to DP shall take place within 30 days from the date of sample shipping.

PMRMA and DP are notified by the Project Data Manager monthly if analytical results are past due or if field samples have not been lotted into all of the analytical fractions requested on the C-O-C forms.

Data entered into the tracking system are as follows:

- Field Information—Site Type, Site ID, Sampling Depth, Date of Sampling, Analyses Requested, and Sample Tag Numbers. Source: copies of field C-O-C forms (originals accompany the samples to the laboratories.)

- Lot Assignment Information—Laboratory conducting the Analysis, Type of Analysis, Lot Designation Code, Lot Sample Numbers, Corresponding Field Sample Numbers, and Sample Depth. Source: Laboratory Lot Designation Forms.

- Date data should be received at DP.

- Date data uploaded onto the RMA Environmental Database.

6.2.3.2 Data Validation

There are two main types of validation to be performed on analytical data generated during the SFS-Phase I. The IRDMIS data routines designed for data validation are "Record Check" and "Group Check". Record Check involves rudimentary data formatting and acceptability checks of individual records entered into the IRDMIS. Record Check also adjusts the analyte concentration for the accuracy of the method used, moisture content, and dilution factors. Group Check involves detailed checks for the existence of corresponding map records and for the acceptability of the data as individual records and as an associated group of data. Under this contract, the PMRMA contract analytical laboratory and DP shall perform the Record Check and Group Check data validation routines. EBASCO shall validate Site IDs and sample tag numbers to ensure that data entry errors are not made at the laboratories.

6.3 BIOTA DATA ANALYSIS

Once the data verification process is complete, the analysis of biota sample data is to be accomplished using PC-based statistics and graphics software. The ability to export biota data from the dBASE III system employed in the BDMS into spreadsheets will facilitate such analyses without incurring data entry errors. The EBASCO Data Management Group will support the SFS-Phase I in the development and use of such statistics as range, mean, median, standard deviation, standard error, 95 percent confidence intervals, factorial analysis of variance,

nonparametric Mann-Kendall test for trend, nonparametric Kruskal-Wallis rank test, regression analysis and Student's-t, as needed in the analysis of the biota tissue data.

7.0 REFERENCES CITED

Armstrong, D.
1972 Distribution of Mammals in Colorado. Museum of Natural History, University of Kansas, Lawrence, Kansas.

Bissel, S.J. and M.B. Dillon
1982 Colorado Mammal Distribution Latilong Study. Colorado Division of Wildlife, Denver, CO.

Bailey, A.M. and R.J. Niedrach
1965 Birds of Colorado. Denver Museum of Natural History, Denver, CO. 895 pp.

Chase, C.A., III, S.J. Bissel, H.E. Kingery, W.D. Graul, and M.M. Dillon
1982 Colorado Bird Distribution Latilong Study. Denver Museum of Natural History, Denver, CO.

EBASCO (Ebasco Services Incorporated)
1994a Supplemental Field Study-Phase I Plan. Contract No. DAAA05-92-D-0002. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted pagination.

1994b Draft Final Integrated Endangerment Assessment/Risk Characterization. 4 vols. Contract No. DAAA05-92-D-002. August. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted pagination.

1994c Accident Prevention Safety Task Plan. Contract No. DAAA05-92-D-002. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted Pagination.

1993 Final Quality Assurance Management Plan, Version 3.0. Contract No. DAAA05-92-D-002. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted Pagination.

RTIC 92017R01
1992 Final Remedial Investigation Summary Report. 6 vols. Contract No. DAAA15-88-D-0024. Prepared for the U.S. Army Program Manager's Office for Rocky mountain Arsenal Contamination Cleanup. Interrupted pagination.

RTIC 89173R02
ESE (Environmental Science and Engineering)
1989 Biota Remedial Investigation Final Report. Version 3.2. Contract No. DAAK11-84-D0016. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted pagination.

Gilbert, R.O.
1987 Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.

MKE (Morrison–Knudsen Engineers)
RTIC 90248R01
1989a Wildlife Resources of the Rocky Mountain Arsenal, Adams County, Colorado. Prepared for Shell Oil Company, Holme Roberts and Owen, Denver, Colorado. 110 pp. and apps.

RTIC 90044R01
1989b Vegetation Resources of Rocky Mountain Arsenal, Adams County, Colorado. Prepared for Shell Oil Company, Holme Roberts and Owen, Denver, Colorado. 61 pp. and apps.

RLSA (R.L. Stollar & Associates Inc.)
RTIC 92287R03
1992 Final Biota Annual Report for 1990 and Summary Report for 1988 to 1990. Comprehensive Monitoring Program. 4 vols. Contract No. DAA15-87-0095. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted pagination.

RTIC 88340R02
1988 Biota Comprehensive Monitoring Program. Final Technical Plan. Version 3.2. 4 vols. Contract No. DAA15-87-0095. Prepared for the U.S. Army Program Manager's Office for Rocky Mountain Arsenal Contamination Cleanup. Interrupted pagination.

USFWS (U.S. Fish and Wildlife Service)
1992 Minutes from Natural Resource Conservation Committee Meeting, 14 July 1992.

Webb, E.A, B. Bennett, and C.R. Prestar
1991 Documentation and Interpretation of Selected Wildlife Habitat Relationships at Rocky Mountain Arsenal. Task Two: Small Birds. 1991 Annual Progress Report. Denver Museum of Natural History, Denver, CO.

Table 3-1 Synopsis of Supplemental Field Study Sampling Program

Sample Taxon	Type of Sample	Sample Timing	Sampled Individual	Method of Collection	# of Samples
beetle	whole body, composite*	late spring to early fall	all individuals collected	pit traps	25
grasshopper	whole body, composite*	late summer to early fall	late instars that are large (but not yet winged if possible)	sweep net and by hand	25
starling	dressed carcass*, **	early summer, about 16 May to 21 June	nestlings just prior to fledging	by hand from nest box	50
deer mouse	whole body***	late spring, early summer	adult	live trap	50
prairie dog	dressed carcass**	juvenile—late spring while female juveniles from previous year are still differentiable	nonlactating 1-year-old female juvenile	live trap or .22-gauge rifle	50+30
		adult—after young of year are well grown but still differentiable	adult		
rabbit	dressed carcass**	late spring, early summer when adults can be differentiated	adult	live trap, .22-gauge rifle, or shotgun	20

* minimum sample weight is 20 grams

** dressed carcass defined for mammals as whole body minus GI tract (intestines, stomach, esophagus), head, skin, and feet; dressed carcass defined for birds as whole body minus GI tract, bill, tarsi, and feathers; NOTE: for 10 percent of the samples, the removed tissues will also be analyzed so that whole body can be approximated for use in BMF calculation and for comparison to predicted tissue, while dressed carcass is for use in estimating dose

*** whole body is minus GI tract; note that if sample is less than 15 grams, don't collect; if less than 20 grams collect a backup sample (same sex if possible)

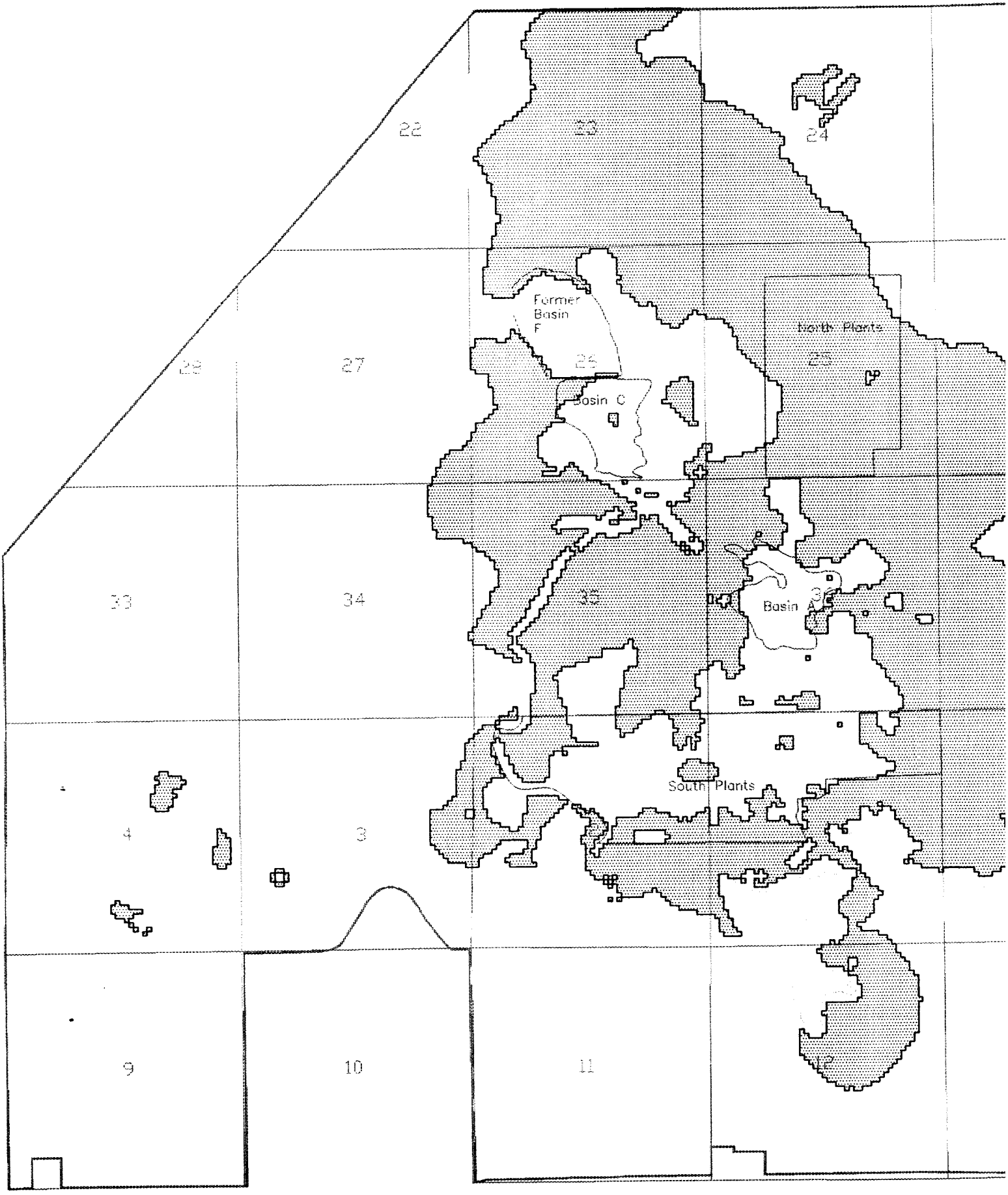
Table 3-2 Species-Specific Sampling Equipment and Supplies

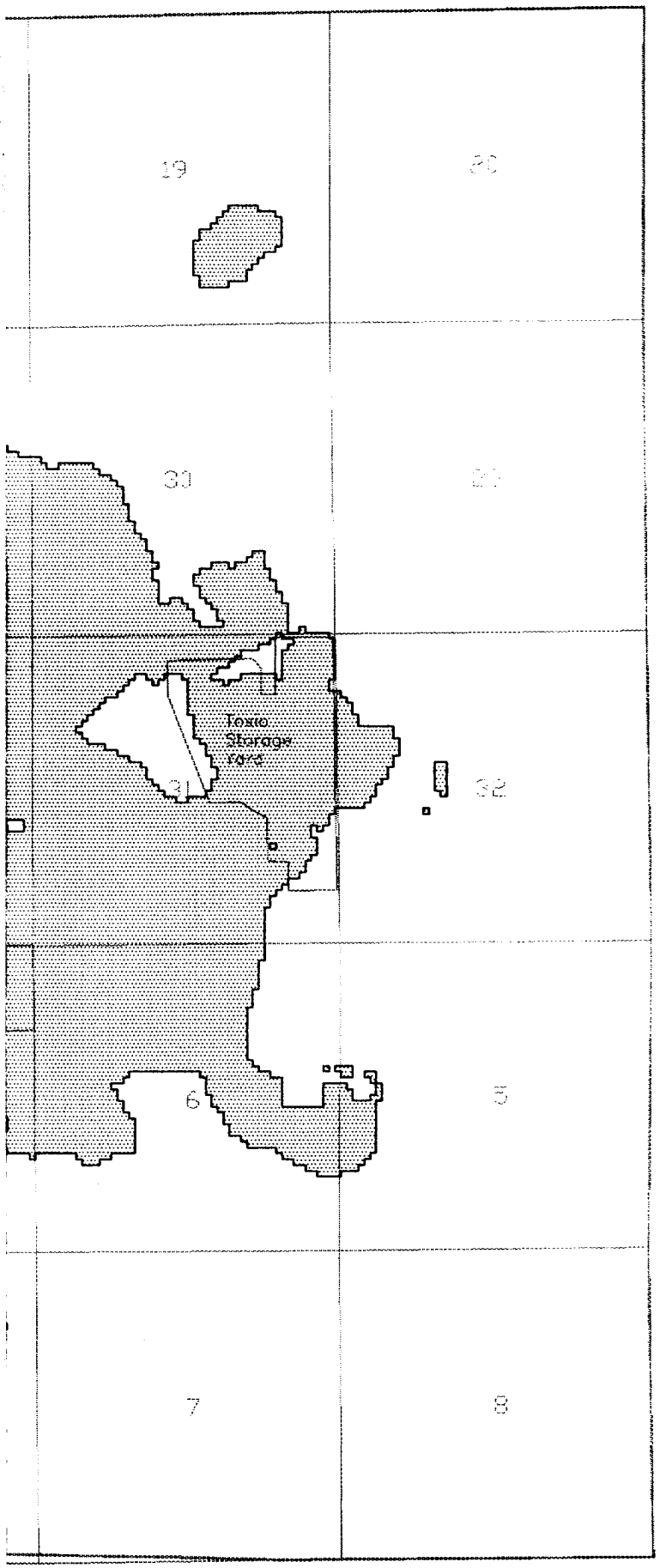
Species/Species Group	Sampling Equipment and Supplies
Prairie dog	"have-a-heart" live traps; alfalfa pellets; .22-caliber rifle; hollow-point .22-caliber cartridges; map showing 50 numbered blocks in AOD; map showing 30 numbered blocks in bald eagle partial exposure area; 80 maps—one of each individual block
Deer mouse	Sherman live traps, bait (Horseman's Edge, which contains molasses and grain, is recommended); clean cloth bags; map of standard 5 by 5 trapping grid; map showing 50 numbered blocks in AOD; 50 maps--one of each individual block
Rabbit	"have-a-heart" live traps; alfalfa pellets; .22-caliber rifle; hollow-point .22-caliber cartridges; 12-, 16-, or 20-gauge shotgun; shells with #6 or #7 steel shot; map showing 20 numbered blocks in AOD; 20 maps—one of each individual block
Starling	cloth bags; dry ice; cooler to use as asphyxiation chamber; map showing starling group locations designated with a letter; 8 maps—one of each group location and showing individual nest box placement at each location [these will be hand collected by USFWS staff members, placed in clean cloth bags provided by the field crew, and delivered to an SFS-Phase I field team member within an hour of collection]
Beetle	unused 1-gallon galvanized paint tins with lids; lawn edging; shovels; glass collection bottles; map showing 25 numbered blocks in AOD; 25 maps—one of each individual block
Grasshopper	sweep insect nets with replaceable, washable bags; glass collection bottles; map showing 25 numbered blocks in AOD; 25 maps—one of each individual block (these are the same as the maps for beetles)

Table 3-3 Site Identification Number Protocol

Digit			
1 2 3 4		5+6+7+8	9+10
Options to Enter			
B S I P	prairie dog (AOD)	B+[block # (001-160)]	94
P	prairie dog (Eagle area)	E+[block # (001-204)]	
D	deer mouse	B+[block # (001-147)]	
C	rabbit	B+[block # (001-084)]	
S	starling	[(01-36*)]+[nest box # (01-49)]	
B	beetles	B+[block # (001-094)]	
G	grasshoppers	B+[block # (001-094)]	

Onpost Section Numbers: From northeast to southeast by rows--22, 23, 24, 19, 20; 28, 27, 26, 25, 30, 29; 33, 34, 35, 36, 31, 32; 4, 3, 2, 1, 6, 5; 9, 10, 11, 12, 7, 6.


22
23
24
Former
Basin
F
North Plants
28
27
26
25
Basin C
33
34
35
36
Basin A
South Plants
4
3
9
10
11
12



Legend

Area of Dispute and Prey Study Area

Lake

31 Section Number

Section Line

-N-

0 2000 4000

Scale in Feet

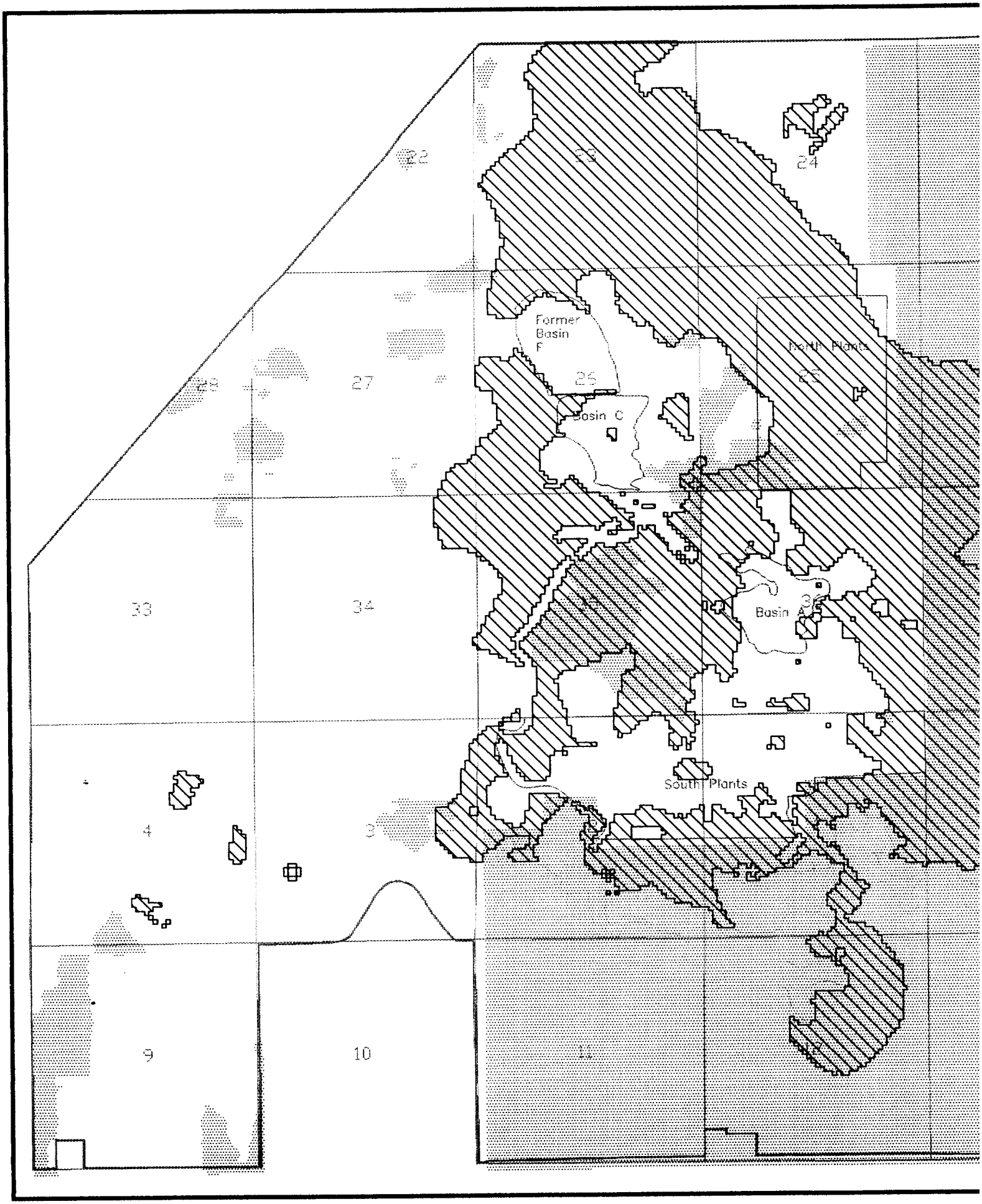
Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

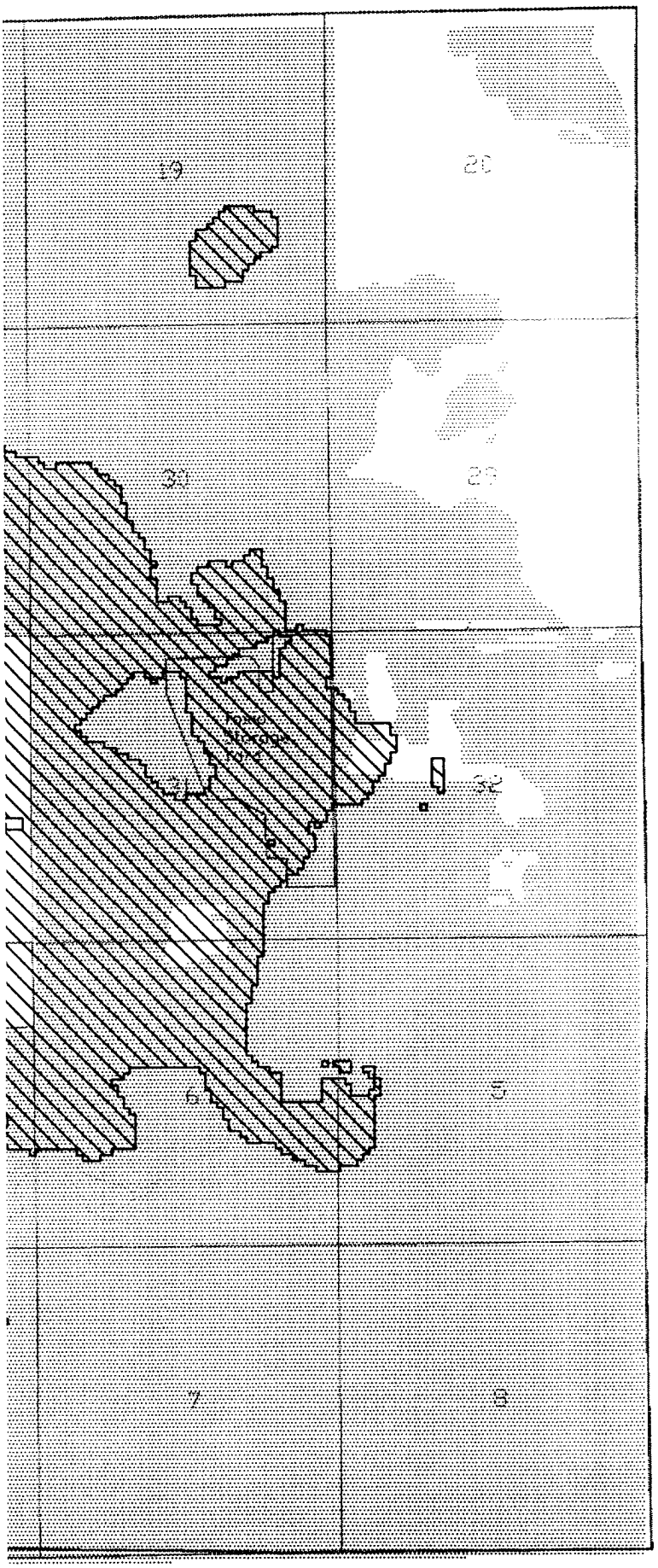
April 1994

Figure 1-1

Supplemental Field Study Phase I
Area of Dispute

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


22
23
24
Former
Basin
F
North Plants
28
27
26
25
Basin C
33
34
35
Basin A
South Plants
4
3
9
10
11



Legend

- Area of dispute
- Bald eagle exposure area inside the area of dispute
- Bald eagle exposure area outside the area of dispute
- Lake
- 31 Section Number
- Section Line

N

0 2000 4000

Scale in Feet

Prepared for:

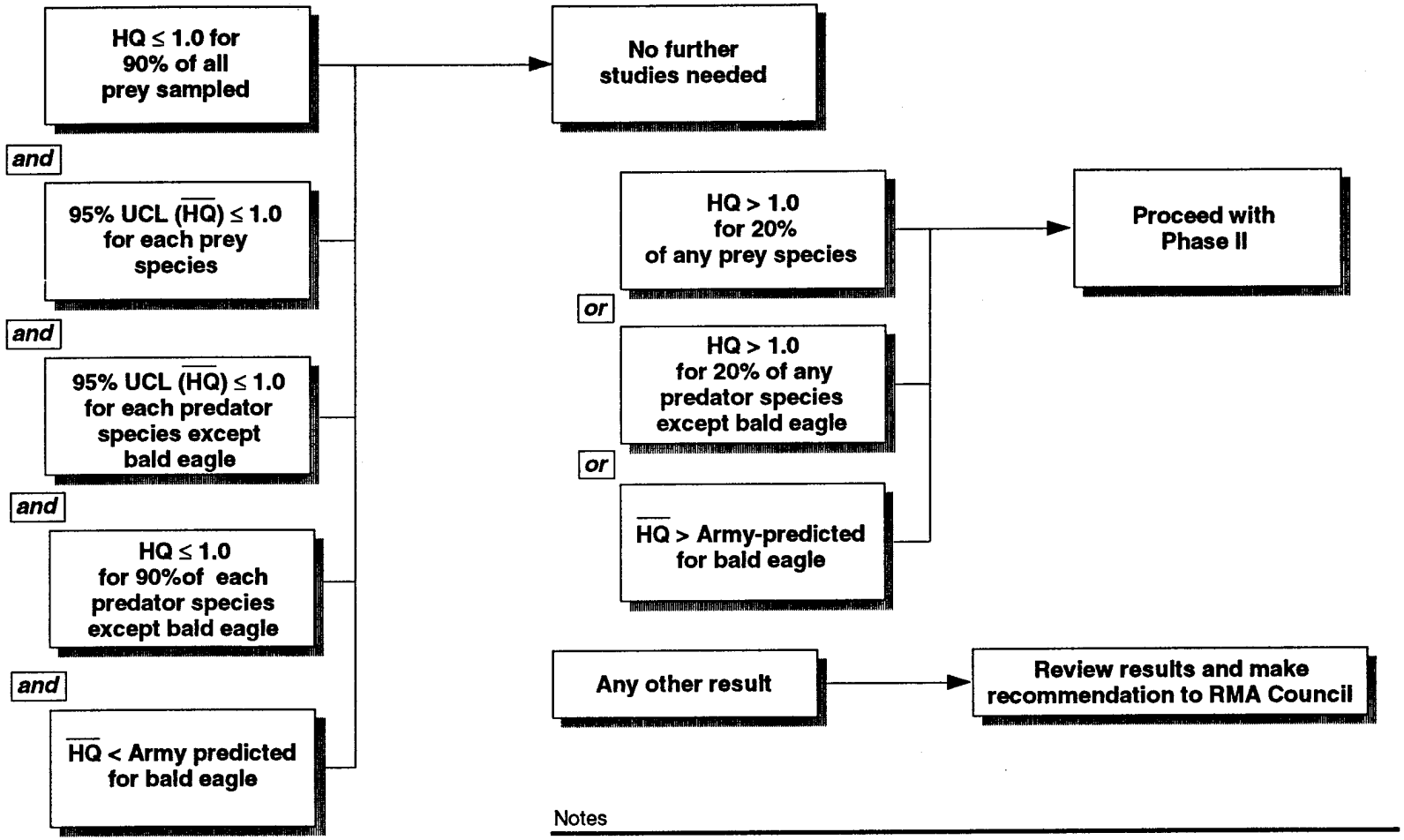
U.S. Army Program Manager
for Rocky Mountain Arsenal

April 1994

Figure 1-2

Supplemental Field Study Phase I
Bald Eagle Exposure Area Outside the
Area of Dispute

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp



Notes

For predator species, hazard quotients are ratios of doses to TRVs.

For prey species, hazard quotients are ratios of tissue concentrations to MATCs.

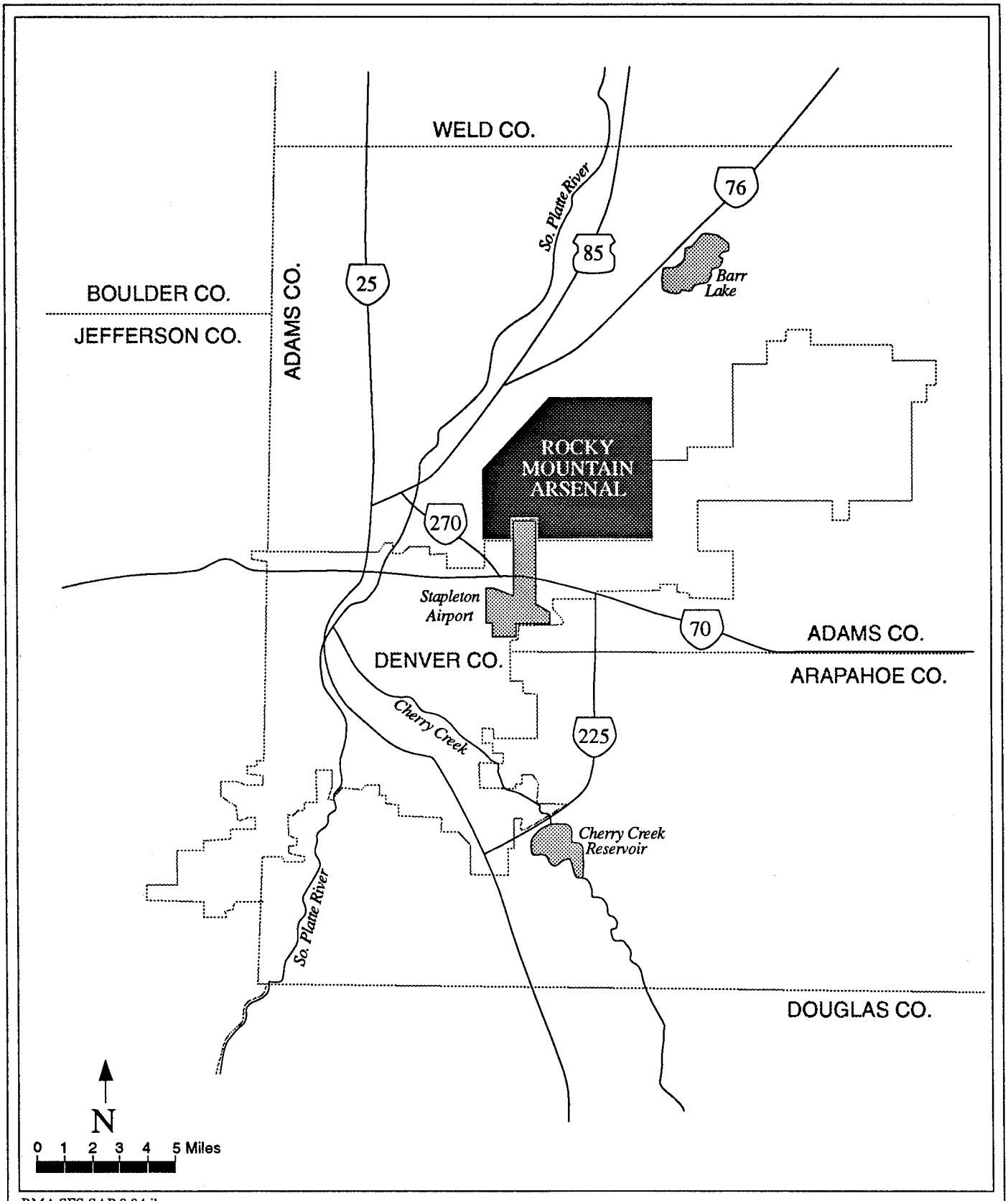
If Phase II is not triggered by analyzing HQ statistics, then HIs will be calculated for predators based on the sum of the HQs for aldrin/dieldrin, DDE/DDT, and endrin.

RMA SFS SAP 8.94.jb

Figure 1-3

Decision Process for SFS - Phase I

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

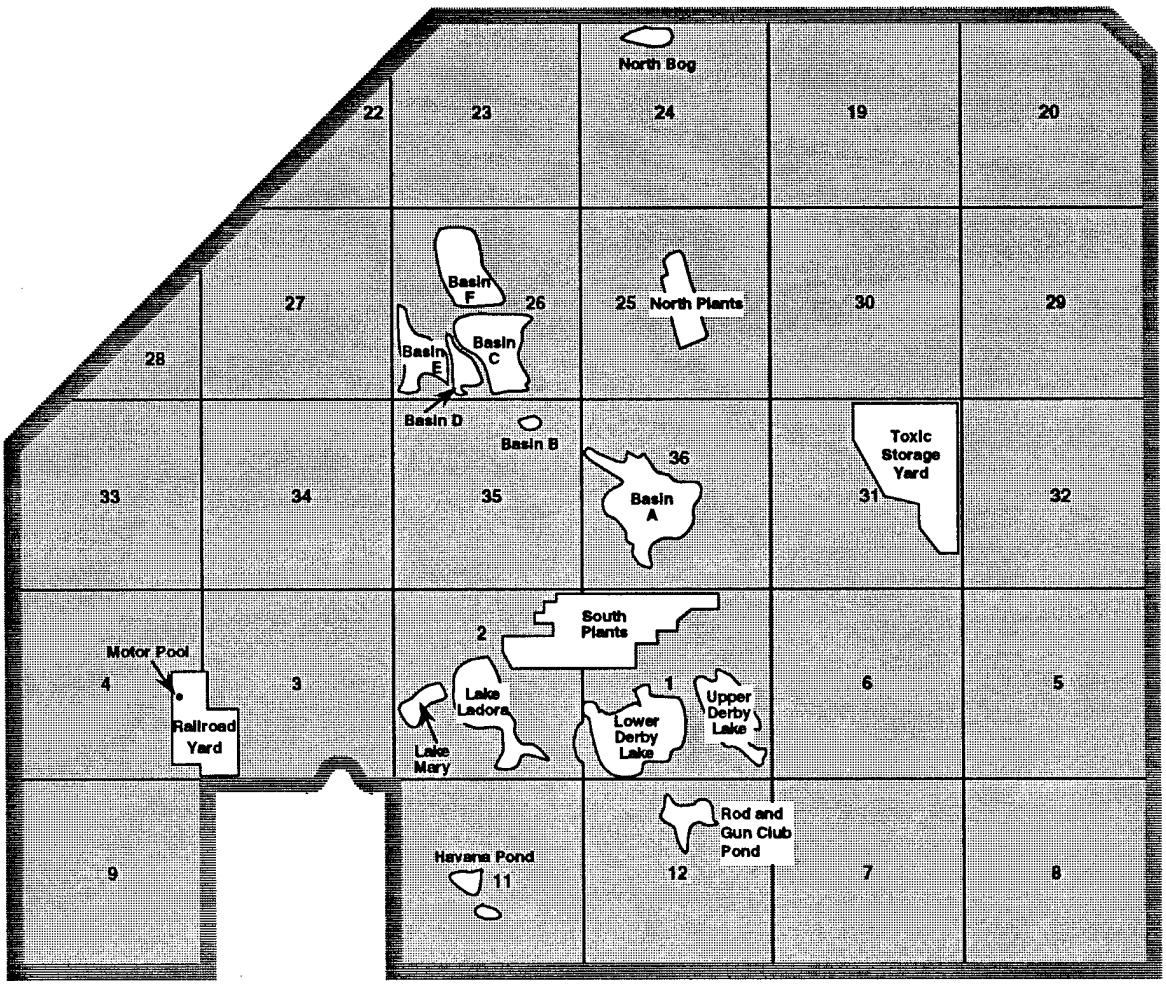


RMA SFS SAP 8.94.jb

Figure 2-1

Location of Rocky Mountain Arsenal

Rocky Mountain Arsenal
Prepared by Ebasco Services Incorporated



RMA SFS SAP 8.94.jb

Figure 2-2

Major Areas of Reference on Rocky Mountain Arsenal

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

Sample Tag / Identification No:	Site Identification:	Site Type: BIOL	Sample Technique: G
Sample Date:	Analyses Requested:		
Collection Time:			
Species:	Sampler (Signature)		
Tissue:			
Remarks:			

Rev. 3/5/90

RMA SFS SAP 8.94.jb

Figure 3-1

Sample Tag

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

Sample Date: _____ (Mo/Date/Yr)

SAMPLE TAG NUMBER	SITE IDENTIFICATION	SITE TYPE	COLLECTION TIME (Military Standard)	SAMPLE TECHNIQUE	SPECIES	TISSUE	ANALYSIS REQUESTED: QC	ARSENIC	MERCURY
A		B I O L		G					
B									
C									
D									
E									

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Sampled and Relinquished by: (Signature) / Date / Time / Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for laboratory by: (Signature)	Relinquished by: (Signature) / Date / Time / Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for laboratory by: (Signature)	Relinquished by: (Signature) / Date / Time / Received by: (Signature)
			Date / Time / Remarks:

Rev. 3/5/90

RMA SFS SAP 8.94.jb

Figure 3-2

Chain of Custody

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

RMA SFS SAP 8.94.jb

Figure 3-3

Field Data Form

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

GENERAL DATA

	SAMPLE TAG/ IDENTIFICATION NUMBER	SITE / AREA IDENTIFICATION	SAMPLE LOCATION: COUNTY	RANGE	TOWN-SHIP	SEC.	QTR.	NORTHING COORDINATES	EASTING COORDINATES	COLLECTION DATE: MO.	DAY	YR.	COLLECTION TIME (Military)	SAMPLE WEIGHT (gm)
A														
B														
C														
D														
E														

Samplers: _____ Logbook and Page Number _____

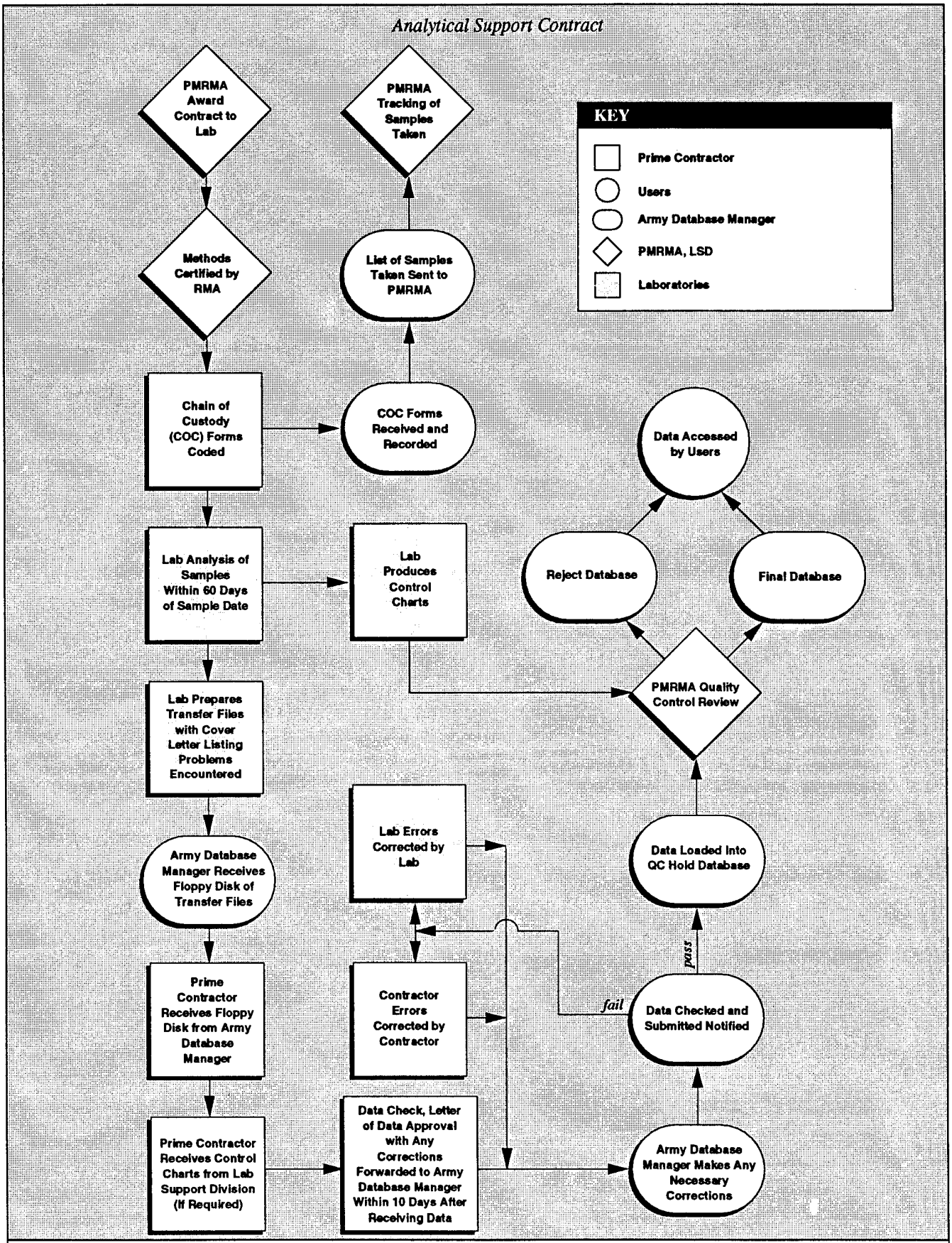
Signature _____ Photo Log Number _____

SPECIES	LIFE STAGE	SEX	TISSUE	COLLECTION METHOD	HABITAT TYPE
ACRI = Grasshopper ANPL = Mallard ATCU = Burrowing Owl BRTE = Cheatgrass BUVI = Great Horned Owl CEDE = Coontail CHVO = Killdeer COLE = Ground Beetle CYLU = Prairie Dog ESLU = Northern Pike FASP = American Kestrel FUAM = Coot HEAN = Sunflower ICME = Black Bullhead ICNE = Brown Bullhead ICPU = Channel Catfish KOIR = Kochia LASE = Prickly Lettuce LEMA = Bluegill MISA = Bass ODHE = Mule Deer ODVI = Whitetail Deer OLIG = Earthworm PEMA = Deer Mouse PHCO = Pheasant PLAN = Plankton POND = American Pondweed POPE = Sego Pondweed STNE = Meadowlark SYAU = Desert Cottontail WCIV = Water Column Macro Invertebrates ZEMA = Mourning Dove Other _____	A B C D E 1 = Adult/Mature 2 = Juvenile 3 = Egg 4 = Seed Stage 5 = Flowering stage 6 = Rapid growth 7 = All life stages	A B C D E M = Male F = Female O = Not applicable U = Unknown	1 = Whole body 2 = Dressed carcass 3 = Egg 4 = Muscle tissue 5 = Liver tissue 6 = Brain tissue 7 = Composite 8 = Above substrate plant 9 = Leaves and flowering heads 10 = Heart 11 = Kidney 12 = Body fat 13 = Solid stomach contents 14 = Liquid stomach contents 15 = Other _____ _____	1 = Shotgun / steel shot 2 = Shotgun / rifle slug 3 = .22 Rifle 4 = Nest box 5 = Live trap 6 = Sweep net 7 = Dip net 8 = Gill net 9 = Trap net 10 = Beach seine 11 = Plankton net 12 = Nest capture 13 = Rake 14 = Scissors 15 = Shovel 16 = Fortuitous live 17 = Fortuitous dead	1 = Annual Forb 2 = Cheatgrass with weedy forbs 3 = Cheatgrass with perennial grasses 4 = Perennial native grasses (heavy soil) 5 = Perennial native grasses (light soil) 6 = Crested wheatgrass 7 = Lacustrine 8 = Persistent emergent wetland 9 = Scrub-shrub wetland 10 = Riparian forest 11 = Riparian shrub 12 = Rabbitbrush 13 = Sand sagebrush 14 = Subshrubs & succulents 15 = Locust thickets 16 = Perennial grasses 17 = Ornamental trees & shrubs 18 = Cultivated 19 = Building area/pavement

SPECIFIC DATA

	NEST BOX/ TRAP ID NUMBER(S)	NUMBER OF INDIVIDUALS IN COMPOSITE	LENGTH (mm)	AGING TISSUE COLL'D	SOIL MAP UNIT	COLLECTION DEPTH (m)	NO. OF TAXA IN SAMPLE	VOLUME OF SOIL (m^3)	COLLECTION AREA (m^2)	EGGS: VOLUME (ml)	WT. (gm)	LN. (mm)	WD. (mm)	SAMPLE VOLUME (ml)
	Great Horned Owl Deer Mice Kestrels	Mice, Grasshoppers, Earthworms	Fish	Deer Fish	Terr. Plants, Deer Mice, Earthworms, Prairie Dogs	Aquatic Plants, Earthworms	Grass-hoppers	Earthworms	Grasshoppers	Great Horned Owl Kestrel	Great Horned Owl Kestrel	G.H.Owl Kestrel	G.H.Owl Kestrel	Plankton
A					A = Antler	OBSERVATIONS AND ABNORMALITIES								
B					F = Fin ray									
C					J = Jaw									
D					O = Otolith									
E					S = Scale									

Rev. 3/5/90



RMA SFS SAP 8.94.jb

Figure 6-1
PMRMA Data Management System

Rocky Mountain Arsenal
Prepared by: Ebasco Services Incorporated

Appendix A

Protocols for Vertebrate Necropsy

Necropsy Protocols for Mammals

Examine the specimen by doing the following:

1. Examine external body carcass including extremities, head, eyes, ears, nose and oral cavity. Observe pelage and body condition.

2. Skin the animal.

3. Make a midline ventral incision from the mandible to pelvis. The incision should be extended laterally at the level of the axilla and pelvis to facilitate exposure.

4. Cut through the chest musculature and ribs parallel to the sternum from the thoracic inlet to the last rib. It may be necessary to make parallel cuts on either side of the sternum and to remove the sternum to facilitate complete exposure. Lateral cuts at the level of the axilla and pelvis may also be necessary to increase exposure. The chest wall and ribs must be broken and forced dorsally to facilitate exposure.

5. Examine the organs of the neck and chest including the thyroid, trachea, esophagus, thymus, lungs, heart, mediastinum, and diaphragm.

6. Examine the abdominal cavity organs including the stomach, intestine, liver, spleen, kidneys, bladder, reproductive organs. An incision through the pelvic girdle must be made to facilitate removal of the entire gastrointestinal tract.

7. Remove GI tract from the body cavity, starting at the level of the oral cavity. The esophagus, stomach, intestines and rectum must be removed, leaving the abdominal fat.

8. Remove the head at the level of the cervical vertebrae.

Fill out necropsy form noting any abnormalities.

Necropsy Protocols for Birds

Examine the specimen by doing the following:

1. Examine external body carcass including wings, legs, head, eyes, beak, and oral cavity. Observe feathers and body condition.

2. Remove feathers.

3. Make a midline ventral incision from the mandible to the pelvis.

4. Cut through the breast musculature and ribs parallel to the keel from the thoracic inlet to the last rib. The chest wall and ribs must be broken and forced dorsally to facilitate exposure.

5. Examine the organs of the neck and thoracic cavity including the thyroid, trachea, esophagus, crop, thymus, lungs, heart, and airsacs.

6. Examine the abdominal cavity organs including the proventriculus, ventriculus, intestines, kidneys, liver, spleen, and reproductive organs. An incision through the pelvic girdle must be made to facilitate removal of the entire gastrointestinal tract.

7. Remove the gastrointestinal tract from the body cavity, starting at the level of the oral cavity caudally through the cloaca, leaving the abdominal fat.

8. Remove beak and keratinized leg parts.

Fill out necropsy form noting any abnormalities.

RMA Supplemental Field Study: Necropsy Report Prosector: Date:

Animal Information

Animal No.: _____ Necropsy Date: _____

B-Tag No.: _____ Termination Date: _____

Sex: M _____ F _____ Found Dead Date: _____

External Observations (size, description, location, etc.)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

X	Remarks	Organ/Tissue	X	Remarks	Organ/Tissue
____	_____	thyroid/para	____	_____	cecum
____	_____	trachea	____	_____	colon
____	_____	esophagus	____	_____	rectum
____	_____	thymus	____	_____	urinary bladder
____	_____	lungs	____	_____	testes
____	_____	heart	____	_____	ovaries
____	_____	liver	____	_____	uterus
____	_____	spleen	____	_____	other
____	_____	right kidney	____	_____	
____	_____	left kidney	____	_____	
____	_____	lymph node	____	_____	
____	_____	stomach	____	_____	
____	_____	duodenum	____	_____	
____	_____	jejenum	____	_____	
____	_____	ileum	____	_____	

Comments: _____

_____

_____

_____

Remarks can use the following symbols:

A: Abnormal
N: No observable lesions
NA: Not applicable
L: Lesion
NE: Not examined
M: Missing
X: Tissue Taken

RMA/1004 08/30/94 4:41 pm bpw

RMA Supplemental Field Study: Necropsy Report Prosector: Date:

Animal Information — Avian

Animal No.: _____

B-Tag No.: _____

Sex: M _____ F _____

Necropsy Date: _____

Termination Date: _____

Found Dead Date: _____

External Observations (size, description, location, etc.)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

X	Remarks	Organ/Tissue	X	Remarks	Organ/Tissue
____	_____	thyroid/para	____	_____	cloaca
____	_____	trachea	____	_____	testes
____	_____	crop	____	_____	ovaries
____	_____	thymus	____	_____	other
____	_____	air sacs	____	_____	
____	_____	lungs	____	_____	
____	_____	heart	____	_____	
____	_____	liver	____	_____	
____	_____	spleen	____	_____	
____	_____	right kidney	____	_____	
____	_____	left kidney	____	_____	
____	_____	lymph node	____	_____	
____	_____	proventriculus	____	_____	
____	_____	ventriculus	____	_____	
____	_____	intestine	____	_____	

Comments: _____

_____

_____

_____

Remarks can use the following symbols:

A: Abnormal
N: No observable lesions
NA: Not applicable
L: Lesion
NE: Not examined
M: Missing
X: Tissue Taken

Appendix B

Protocols for Computer Data Entry

The instructions on the following pages are for the general use of the BIOTACOC data entry/print out program. They are not specific to the SFS. Therefore, any situations or species that are not applicable to the SFS program should be ignored.

INSTRUCTIONS FOR BIOTACOC DATA ENTRY/PRINT OUT PROGRAM

Step One: Turn on laptop with DOS disk in drive A and BIOTACOC.* disk in drive B.

Step Two: Type in "GO" without the quotes, then hit the enter key (the necessary files will be transferred to the C:ramdisk and the program will be started).

Step Three: Operate the program.

Hit the "Enter" key after the introductory screen.

Screen 1 offers three options:

1. Entry/Update Options.
2. Print Options.
3. HELP and required companion files.

Follow instructions to select alternative options.

1. Entry/Update Options

1.1 New B-tag.

1.2 First F-tag of a composite sample. Note: when entering data on deer mice of different sex from the same sites, be sure not to combine sexes. Avoid this by entering a unique first F-tag of a composite sample for each sex. If a combined sex sample must be made, consult the Field Coordinator.

1.3 F-tag of a truly fortuitous sample.

1.4 Add to a previous F-tag or convert F-tag to a B-tag.

1.5 Edit an existing B-tag. An existing B-tag can only be edited on the same date that the B-tag is entered, and only if the B-tag has not yet been printed. After the B-tag has been printed, edits can only be made on the paper copy.

Note: Be sure to use the next consecutive B- or F-tag number by referring to the last used tag numbers indicated at the top of the screen. If a previously used tag is entered, the computer will 'beep' and tell you to try again. It is still possible to accidentally skip a tag number, so use caution.

Following the selection of entry/update options 1.1 through 1.5, a screen prompts for the selection of the appropriate data input/edit screen based on species.

1. Select the appropriate species or group.

2. If the species or group does not appear in the screen options, review a blank field data form and the species for which specific information is recorded. Choose a species with data parameters similar to the species for which data are currently being entered.

3. Select F-tag or B-tag entry.
   Note: Review the tag number typed before pressing the enter key. Once the number is entered, it is more difficult to make corrections.

4. Enter the Site ID number.

Note: Carefully review the Site ID number and project code before pressing the enter key for these fields. Once entered, it is impossible to make corrections without changing to the edit screen or escaping and starting over.

5. Enter the rest of the applicable data.
   Note: Skip through any unneeded fields by hitting the enter key.

6. When converting a composite sample of F-tags to a B-tag, the last individual or sample collected must also receive an F-tag (e.g., if two F-tag samples for a composite grasshopper sample do not make the minimum weight, another sample must be collected. The next sample collected for grasshoppers should be given a third F-tag number and then all three F-tags used to form one B-tag sample). After the first F-tag is entered, subsequent F-tags are entered under the B-tag format (and not as individual F-tags).

7. If the sample location coordinates section is automatically completed, and no comments are to be added, use the page-down key to skip the entire section. Double check coordinates first.

8. Choose to either accept data, retry, or exit. Only the "accept" option saves the data.

2. Print Options

   2.1 Print out FDFs, C-O-C forms, and Sample Tags.
   2.2 Print out Sample Inventory.
   2.3 Print out data for QA.

   Screen 2.1, Print out FDFs, C-O-C forms and Sample Tags, produces the following screen:

Screen 2.1 Form Print Options.

2.1.1 Print out all new sample entries. This option prints out all forms that have not previously been printed.
2.1.2 Print out selected sample tags.
2.1.3 Print out TEST tag to align forms.
Note: The FDF, C-O-C forms and sample tags can be printed out only once after they are entered.

Screen 2.2, Print out Sample Inventory, processes the database and produces a species-specific inventory of collected samples. The site ID, B-tag, and F-tag will be listed for all samples in the database. For mice, the weights will also be reported. This contains 27 species options.

Screen 2.3, Print out Data for QA, prints out all data fields for all samples. This function can be used for the QC of the data. The selection of this option prints out the following screen:

2.3.1 Print out data for recently entered data.
2.3.2 Print out a previous data block.
2.3.3 Print out the data for a selected group.
2.3.4 Print out a complete data listing.

When finished with the last entry, save and print out the data. Escape back to the 'C' prompt (three steps) and type in "quit" without the quotes. You will be prompted to insert the master and backup disks to store the data. If you turn the computer off before saving the data, all changes will be lost and must be re-entered.

Additional notes:

1. A power saver has been installed. The screen will go dark after being idle for more than three minutes. Hit any key to bring the screen back, but be aware that if a character key is hit; that information may be entered into an open field. It is best to hit an arrow key.

2. Be aware that no corrections or form printouts can be made for B-tag samples entered before the current date.

3. If the program fails (i.e., 'C' prompt appears in upper left corner of screen), type in 'BIOTACOC' to restart the program.

4. The data input screens prompt for a few data input items before presenting additional data-entry parameters. Once the last item in a set has been entered, it is not possible to return to that set of parameters. Within a set of input items it is possible to move

forward or backward through the set with the up or down arrow keys. Screens can be abandoned at any point by hitting ESC key.

Appendix C

Protocols for Surveying Sample Collection Locations

Global Positioning System (GPS) equipment will be used to survey the sample locations. The GPS equipment will be obtained on loan from the Rocky Mountain Arsenal (RMA) field office of the U.S. Geological Survey (USGS). A base station (Trimble Geodetic Surveyor, model 4000SE) with antenna dish and backpack, mobile unit (Trimble GPS Pathfinder Basic +; code phase navigation grade receiver) with carrying case and extra batteries, and a collapsible surveyor's tripod are the equipment that will be used in the field. The USGS will be responsible for setting up the base station at the beginning of the day, saving the data from satellite signals at the base station, and shutting down the base station at the end of each day. The base station will be positioned over an accurately known wellhead location just north of December 7th Avenue at RMA. The USGS will also be responsible for downloading the data from the Pathfinder into a desktop computer and analyzing it with a software program (Trimble TRIMNET + for GP Survey, v1.10) to compute state planar coordinates for the sample collection stakes. The mobile unit, tripod, and almanac of satellite information will be checked out from the USGS at the beginning of each day and taken to the sampling collection locations, marked by a four-foot painted wooden stake with fluorescent flagging, within each sample block.

The following information describes the step-by-step use of acquiring state planar coordinate data with the Pathfinder mobile unit. More detailed instructions can be found in the Pathfinder operating manual that can be obtained from the USGS.

1. Create a data sheet that will be turned in to the USGS to aid them in the data analysis of the information stored in the Pathfinder. The data sheet should consist of six columns with the headings: Block #, Waypoints, Time Period, # of Space Vehicles (# SV), Positional Dilution of Precision (PDOP), and Comments. The block # is the sample block format used in the project (for example, C023); the Waypoints column contains, in each row, the 25 waypoints (that is, data points) collected at that stake (for example, 1-25 or 76-100); the Time Period column contains the start and stop times, in military time, of the waypoints collection (for example, 1031-1033); the # SV column contains the number of satellites, usually 0-7, that the Pathfinder is receiving signals from at the beginning and

end of the waypoints collection (for example, 5, 7); the PDOP column contains the multiplicative factors indicating additional error due to geometry at the beginning and end of the waypoints collection (for example, 2.7, 4.1); and the Comments column contains comments such as the distance from the tripod's center to the stake (see step 2) or information that might explain unusual circumstances during data collection or reasons why the data collection at a particular stake is invalid (for example, low batteries, accidentally deleted some waypoints). Data collection from different days should be separated by the date and a couple rows of blank space. The name and location of the project, as well as the data collector's full name, should be placed at the top of each page. A copy of the completed data sheet should be made and the original placed in the project files before giving the copy to the USGS.

2. Once at the sampling collection location stake within a sample block, center the extended tripod over the stake with the base approximately level. The tripod does not have to be precisely centered over the stake if it is not possible due to an obstruction (for example, a fence or building) or uneven terrain. The precision of the information collected, and its use, will not be significantly affected because the tripod's center is a few inches to about one foot away from the stake. If the tripod's center is more than about one foot away from the stake, it should be noted in the field notebook and on the data sheet (Comments column) turned in to the USGS.

3. Remove the Pathfinder from its carrying case and place it atop the tripod's base so that the built-in antenna is facing up. Enter the appropriate information in the Block # and Waypoints columns on the data sheet.

4. Turn on the Pathfinder by turning the knob clockwise from the "OFF" position to the position marked "STS". Now, the Pathfinder will begin receiving satellite signals.

5. If the screen cursor is blinking at the word "more" in the lower right corner, use the lowermost toggle switch and click the toggle down until the screen displays the number of SVs from which the unit is receiving signals. If the screen cursor is not blinking at the word "more", then click the uppermost toggle switch to the left to initiate the blinking. The unit must be receiving signals from at least four satellites to establish a position. The more satellites that the unit is receiving signals from, preferably five or more, the more accurate the position estimate. Usually, the number of SVs will increase to six or seven within a few minutes of switching to this screen. If this does not happen, refer to the almanac for RMA to note when the number of satellites above the horizon will increase. Once the number of SVs is five or more, record the number of satellites onto the data sheet in the # SV column.

6. If the screen cursor is blinking at the word "more" in the lower right corner, use the lowermost toggle switch and click the toggle down until the screen displays the PDOP reading, along with vertical DOP (VDOP), horizontal DOP (HDOP), and others. If the screen cursor is not blinking at the word "more", then click the uppermost toggle switch to the left to initiate the blinking. The unit must display a PDOP reading of no more than 4.9 for the accuracy required (± 2-5 meters) in the SFS–Phase I project. A higher PDOP reading means less accuracy due to the geometry of the available satellite signals being received. Usually, the PDOP will decrease below 5.0 within a few minutes of switching to this screen. If this does not happen, refer to the almanac for RMA to note when the PDOP will decrease. Sometimes, the wait can be almost an hour. Once the PDOP reading is less than 5.0, record the PDOP onto the data sheet in the PDOP column.

7. Turn the knob counterclockwise to the "WPTS" (Waypoints) position. Using the uppermost toggle switch, click toggle to the right to move the screen cursor across the screen and down to the lower right corner where the word "SAVE" appears. The correct starting waypoint number should be in the upper left corner of the screen. Record the starting time on the data sheet and click the lowermost toggle switch down to save the

first waypoint for that location. Wait five seconds and click the same toggle switch down again. Repeat the procedure until the 25th waypoint has been saved and the screen displays the waypoint that will be used at the next location. When the 25th waypoint has been saved, record the ending time on the data sheet.

8. Turn the knob clockwise to the "STS" position. Using the same procedures as outlined in steps 5 and 6, note and record the # SVs and the PDOP reading in the appropriate columns and separate the first number from the second by a comma (see step 1). If the # SVs is now less than five or the PDOP is now more than 5.9, put an asterisk in the Comments column and start saving 25 additional waypoints by following steps 5 through 8.

9. When 25 waypoints have been saved under satisfactory conditions, turn the knob counterclockwise to the "OFF" position. The unit must not be turned on again for at least three minutes. Place the Pathfinder back into the carrying case, fold up the tripod, and move to the next sample collection stake.

Appendix D

Field Program Forms

LIST OF FORMS

Field Data Form (FDF)
Chain of Custody (COC)
Sample Tag
Mammalian Necropsy Procedures Form
Avian Necropsy Procedures Form
Field Procedures Familiarity Verification Form
Field Protocol Deviation Form
Field File Checkoff List
Insect Taxonomy Record Form

LIST OF MAPS

RMA-wide Maps and Maps of Individual Sections with Numbered Random Blocks for Prairie Dogs (PD-50 plus PD-30) (32 maps)

RMA-wide Maps and Maps of Individual Sections with Numbered Random Blocks for Rabbits (21 maps)

RMA-wide Maps and Maps of Individual Sections with Numbered Random Blocks for Small Mammals (Deer Mice) (20 maps)

RMA-wide Maps and Maps of Individual Sections with Numbered Random Blocks for Insects (Grasshoppers and Ground-Dwelling Beetles) (20 maps)

GENERAL DATA

SAMPLE TAG/ IDENTIFICATION NUMBER	SITE / AREA IDENTIFICATION	SAMPLE LOCATION							COLLECTION DATE			COLLECTION TIME (Military)	SAMPLE WEIGHT (gm)
		COUNTY	RANGE	TOWN-SHIP	SEC.	QTR.	NORTHING COORDINATES	EASTING COORDINATES	MO.	DAY	YR.		

A
B
C
D
E

Samplers:

Logbook and Page Number

Signature

Photo Log Number

SPECIES	LIFE STAGE	SEX	TISSUE	COLLECTION METHOD	HABITAT TYPE
ACRI = Grasshopper ANPL = Mallard ATCU = Burrowing Owl BRTE = Cheatgrass BUVI = Great Horned Owl CEDE = Coontail CHVO = Killdeer COLE = Ground Beetle CYLU = Prairie Dog ESLU = Northern Pike FASP = American Kestrel FUAM = Coot HEAN = Sunflower ICME = Black Bullhead ICNE = Brown Bullhead ICPU = Channel Catfish KOIR = Kochia LASE = Prickly Lettuce LEMA = Bluegill MISA = Bass ODHE = Mule Deer ODVI = Whitetail Deer OLIG = Earthworm PEMA = Deer Mouse PHCO = Pheasant PLAN = Plankton POND = American Pondweed POPE = Sego Pondweed STNE = Meadowlark SYAU = Desert Cottontail WCIV = Water Column Macro Invertebrates ZEMA = Mourning Dove Other _____	A B C D E 1 = Adult/Mature 2 = Juvenile 3 = Egg 4 = Seed Stage 5 = Flowering stage 6 = Rapid growth 7 = All life stages	A B C D E M = Male F = Female O = Not applicable U = Unknown	1 = Whole body 2 = Dressed carcass 3 = Egg 4 = Muscle tissue 5 = Liver tissue 6 = Brain tissue 7 = Composite 8 = Above substrate plant 9 = Leaves and flowering heads 10 = Heart 11 = Kidney 12 = Body fat 13 = Solid stomach contents 14 = Liquid stomach contents 15 = Other _____ _____	1 = Shotgun / steel shot 2 = Shotgun / rifle slug 3 = .22 Rifle 4 = Nest box 5 = Live trap 6 = Sweep net 7 = Dip net 8 = Gill net 9 = Trap net 10 = Beach seine 11 = Plankton net 12 = Nest capture 13 = Rake 14 = Scissors 15 = Shovel 16 = Fortuitous live 17 = Fortuitous dead	1 = Annual Forb 2 = Cheatgrass with weedy forbs 3 = Cheatgrass with perennial grasses 4 = Perennial native grasses (heavy soil) 5 = Perennial native grasses (light soil) 6 = Crested wheatgrass 7 = Lacustrine 8 = Persistent emergent wetland 9 = Scrub-shrub wetland 10 = Riparian forest 11 = Riparian shrub 12 = Rabbitbrush 13 = Sand sagebrush 14 = Subshrubs & succulents 15 = Locust thickets 16 = Perennial grasses 17 = Ornamental trees & shrubs 18 = Cultivated 19 = Building area/pavement

SPECIFIC DATA

NEST BOX/ TRAP ID NUMBER(S)	NUMBER OF INDIVIDUALS IN COMPOSITE	LENGTH (mm)	AGING TISSUE COLLT'D	SOIL MAP UNIT	COLLECTION DEPTH (m)	NO. OF TAXA IN SAMPLE	VOLUME OF SOIL (m^3)	COLLECTION AREA (m^2)	EGGS				SAMPLE VOLUME (ml)
									VOLUME (ml)	WT. (gm)	LN. (mm)	WD. (mm)	
Great Horned Owl Deer Mice Kestrels	Mice, Grasshoppers, Earthworms	Fish	Deer Fish	Terr. Plants, Deer Mice, Earthworms, Prairie Dogs	Aquatic Plants, Earthworms	Grass-hoppers	Earthworms	Grasshoppers	Great Horned Owl Kestrel	Great Horned Owl Kestrel	G.H.Owl Kestrel	G.H.Owl Kestrel	Plankton

A
B
C
D
E

A = Antler
F = Fin ray
J = Jaw
O = Otolith
S = Scale

OBSERVATIONS AND ABNORMALITIES

Rev. 3/5/90

CHAIN OF CUSTODY RECORD

Sample Date: _____

(Mo/Date/Yr)

	SAMPLE TAG NUMBER	SITE IDENTIFICATION	SITE TYPE	COLLECTION TIME (Military Standard)	SAMPLE TECHNIQUE	SPECIES	TISSUE	ANALYSIS REQUESTED: OCPs	ARSENIC	MERCURY
			B I O L		G					
A										
B										
C										
D										
E										

Sampled and Relinquished by: (Signature)	Date / Time	Received by: (Signature)			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)			
Relinquished by: (Signature)	Date / Time	Received for laboratory by: (Signature)	Date / Time	Remarks:	
Relinquished by: (Signature)	Date / Time	Received for laboratory by: (Signature)	Date / Time		

Rev. 3/5/90

Sample Tag / Identification No:	Site Identification:	Site Type: BIOL	Sample Technique: G
Sample Date:	Analyses Requested:		
Collection Time:			
Species:	Sampler (Signature)		
Tissue:			
Remarks:			

Rev. 3/5/90

RMA Supplemental Field Study: Necropsy Report Prosector: Date:

Animal Information

Animal No.: _____ Necropsy Date: _____

B-Tag No.: _____ Termination Date: _____

Sex: M _____ F _____ Found Dead Date: _____

External Observations (size, description, location, etc.)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

X	Remarks	Organ/Tissue	X	Remarks	Organ/Tissue
____	_____	thyroid/para	____	_____	cecum
____	_____	trachea	____	_____	colon
____	_____	esophagus	____	_____	rectum
____	_____	thymus	____	_____	urinary bladder
____	_____	lungs	____	_____	testes
____	_____	heart	____	_____	ovaries
____	_____	liver	____	_____	uterus
____	_____	spleen	____	_____	other
____	_____	right kidney	____	_____	
____	_____	left kidney	____	_____	
____	_____	lymph node	____	_____	
____	_____	stomach	____	_____	
____	_____	duodenum	____	_____	
____	_____	jejenum	____	_____	
____	_____	ileum	____	_____	

Comments: _____
_____
_____
_____

Remarks can use the following symbols:

A: Abnormal
N: No observable lesions
NA: Not applicable
L: Lesion
NE: Not examined
M: Missing
X: Tissue Taken

RMA/1004 08/10/94 3:53 pm bpw

RMA Supplemental Field Study: Necropsy Report Prosector: Date:

Animal Information — Avian

Animal No.: _____ Necropsy Date: _____

B-Tag No.: _____ Termination Date: _____

Sex: M _____ F _____ Found Dead Date: _____

External Observations (size, description, location, etc.)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

X	Remarks	Organ/Tissue	X	Remarks	Organ/Tissue
____	_____	thyroid/para	____	_____	cloaca
____	_____	trachea	____	_____	testes
____	_____	crop	____	_____	ovaries
____	_____	thymus	____	_____	other
____	_____	air sacs	____	_____	
____	_____	lungs	____	_____	
____	_____	heart	____	_____	
____	_____	liver	____	_____	
____	_____	spleen	____	_____	
____	_____	right kidney	____	_____	
____	_____	left kidney	____	_____	
____	_____	lymph node	____	_____	
____	_____	proventriculus	____	_____	
____	_____	ventriculus	____	_____	
____	_____	intestine	____	_____	

Comments: _____

_____

_____

_____

Remarks can use the following symbols:

A: Abnormal
N: No observable lesions
NA: Not applicable
L: Lesion
NE: Not examined
M: Missing
X: Tissue Taken

FIELD PROCEDURES FAMILIARITY VERIFICATION FORM

Supplemental Field Study

BIOTA

PLEASE READ THIS FORM, CHECK OFF EACH DOCUMENT, AND BOTH SIGN AND PRINT YOUR NAME AT THE BOTTOM OF THIS FORM. GIVE THE COMPLETED FORM TO THE FIELD COORDINATOR BEFORE BEGINNING FIELD WORK ON RMA.

I have thoroughly read and understand the field protocol requirements in each of the following documents.

___ Sampling and Analysis Plan (SAP)

___ Accident Prevention Safety Task Plan, RMA, SFS (APSTP)

___ Final Quality Assurance Management Plan (QAMP), Sections B-2, B-3, and B-5 only

I agree to abide by these protocols, unless field conditions require a deviation that will be approved by the Field Coordinator (SAP, SFS-P), by the Health and Safety Site Manager (APSTP), or Quality Assurance Manager (QAMP). Any such deviations will be documented by a Field Procedures Deviation Form.

_____ (Signature)

(Printed Name)

FIELD PROTOCOL DEVIATION FORM

Collection Activity Being Performed: Date: _____
Source of Protocol:
Established Protocol:
Nature of Deviation:
Reason for Deviation:
Is this a one-time-only deviation ( ), or a deviation that will be used from this date forward in the program ( )?
Person Approving Deviation:
Signature of Person Approving Deviation:
Person Implementing Deviation:
Signature of Person Approving Deviation:
Other Comments:

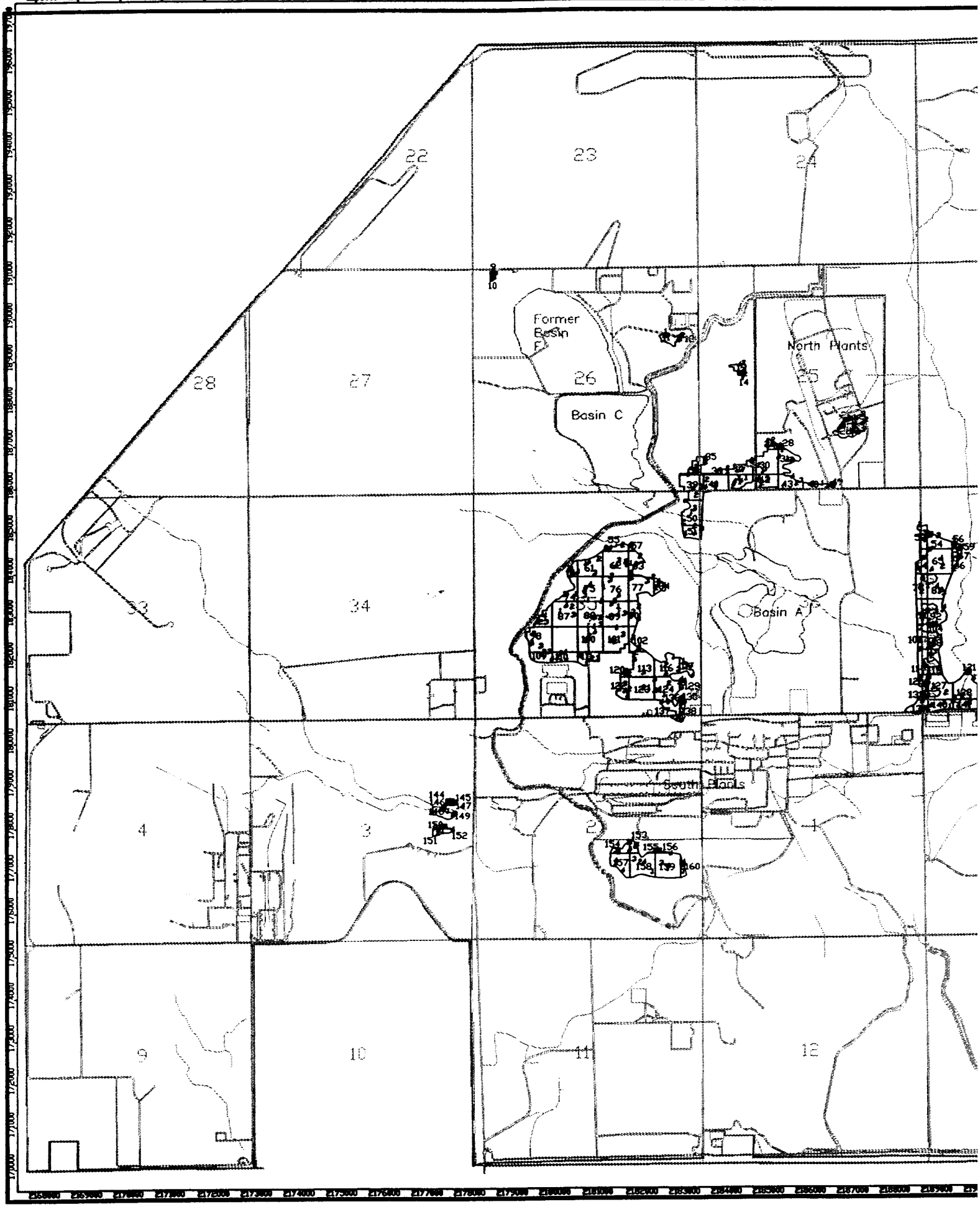
FIELD FILE CHECKOFF LIST*

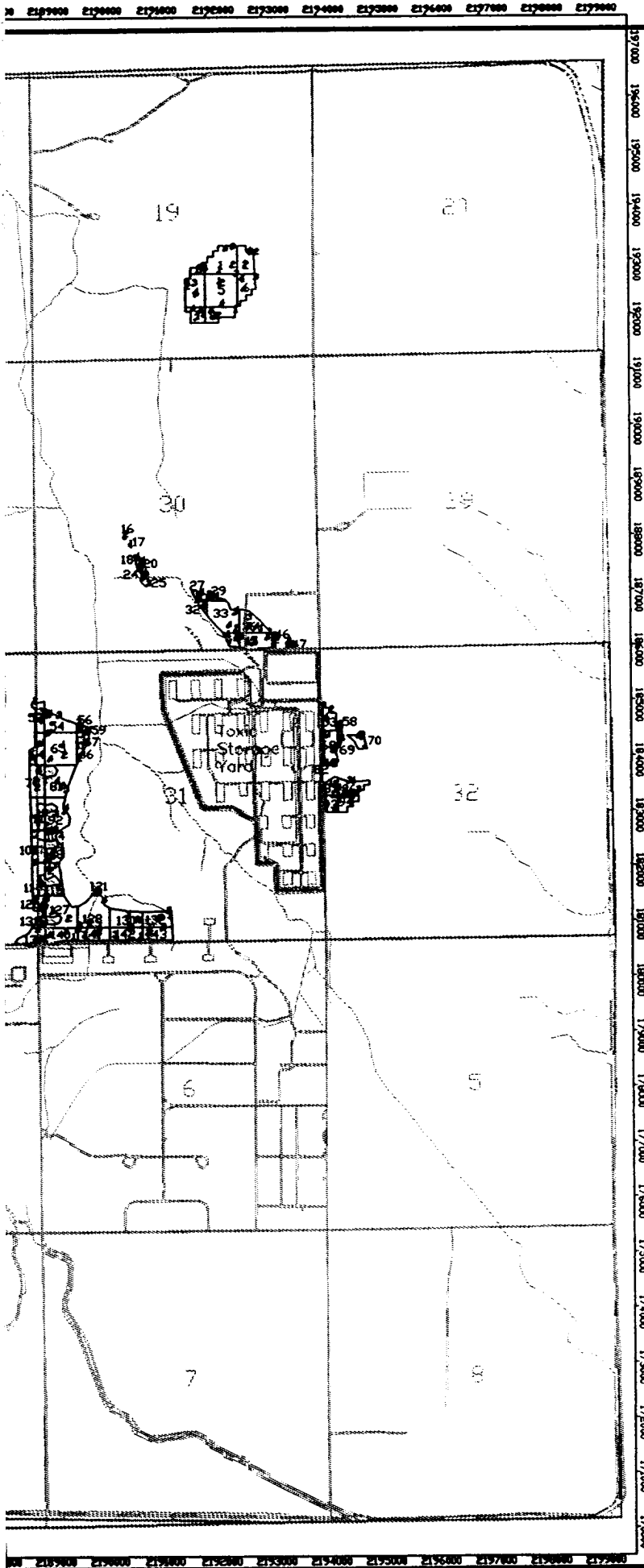
Sample Tag Number	Field Logbook Notes	Field Data Form	Collection Location Map(s)	Chain-of-Custody Form	Airbill

*For each form added to the field file for a sample, the sample tag number is to be recorded on this form and the appropriate column is to be dated and initialed by the person adding the form.

INSECT TAXONOMY RECORD FORM

Sample Tag Number:				
Date of Sample Collection:				
Time of Sample Collection:				
Taxonomic Category Level	Taxonomic Category Name	Number of Individuals	Percent of Total Individuals	Comments


Former Basin F
North Plants
Basin C
Basin A
South Plants
22
23
24
28
27
26
25
34
3
4
7
2
1
9
10
11
12



Legend

Sampling Block

Lake

31 Section Number

Section Line

N

0 2000 4000

Scale in Feet

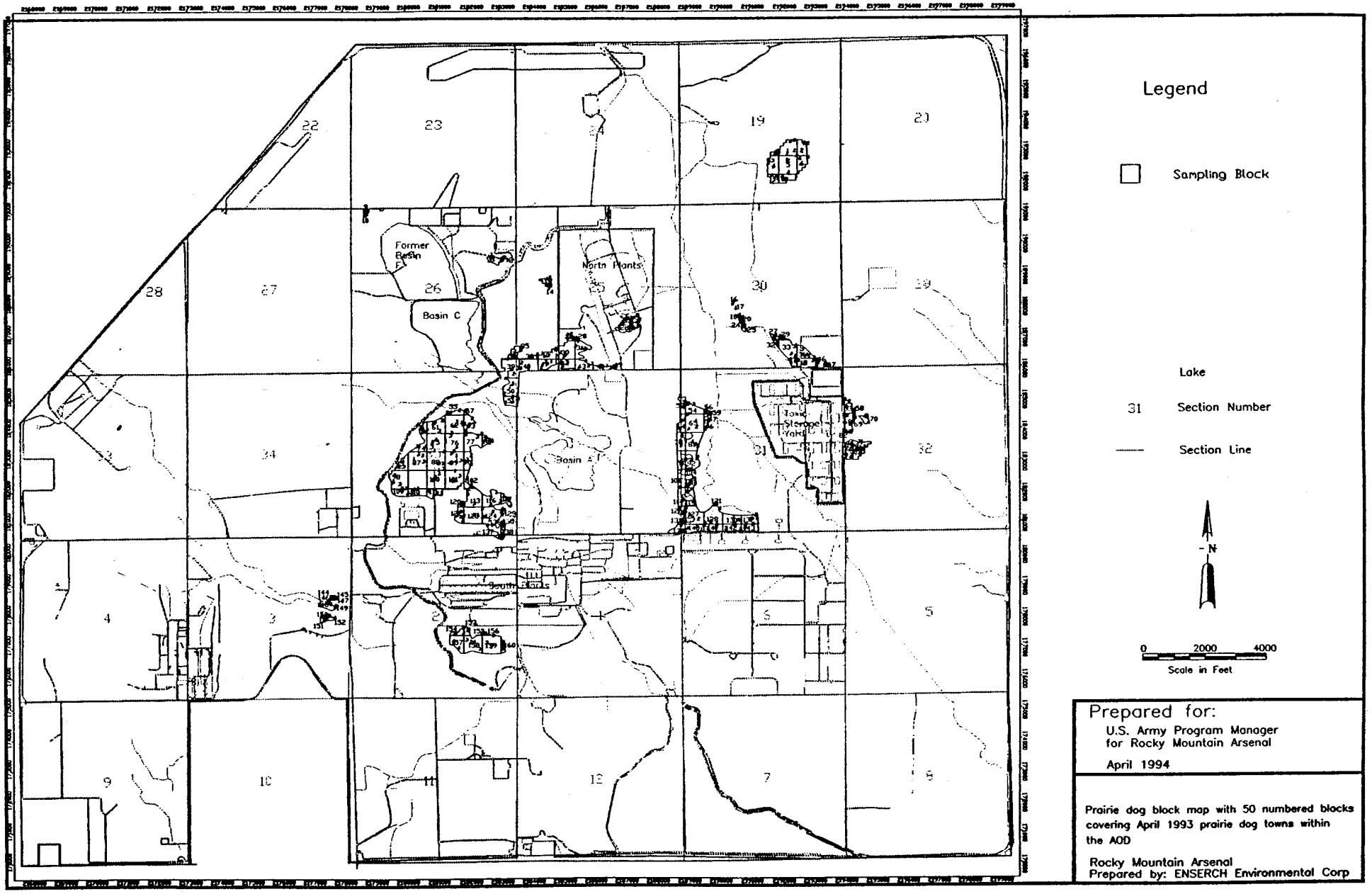
Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

April 1994

Prairie dog block map with 50 numbered blocks covering April 1993 prairie dog towns within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp

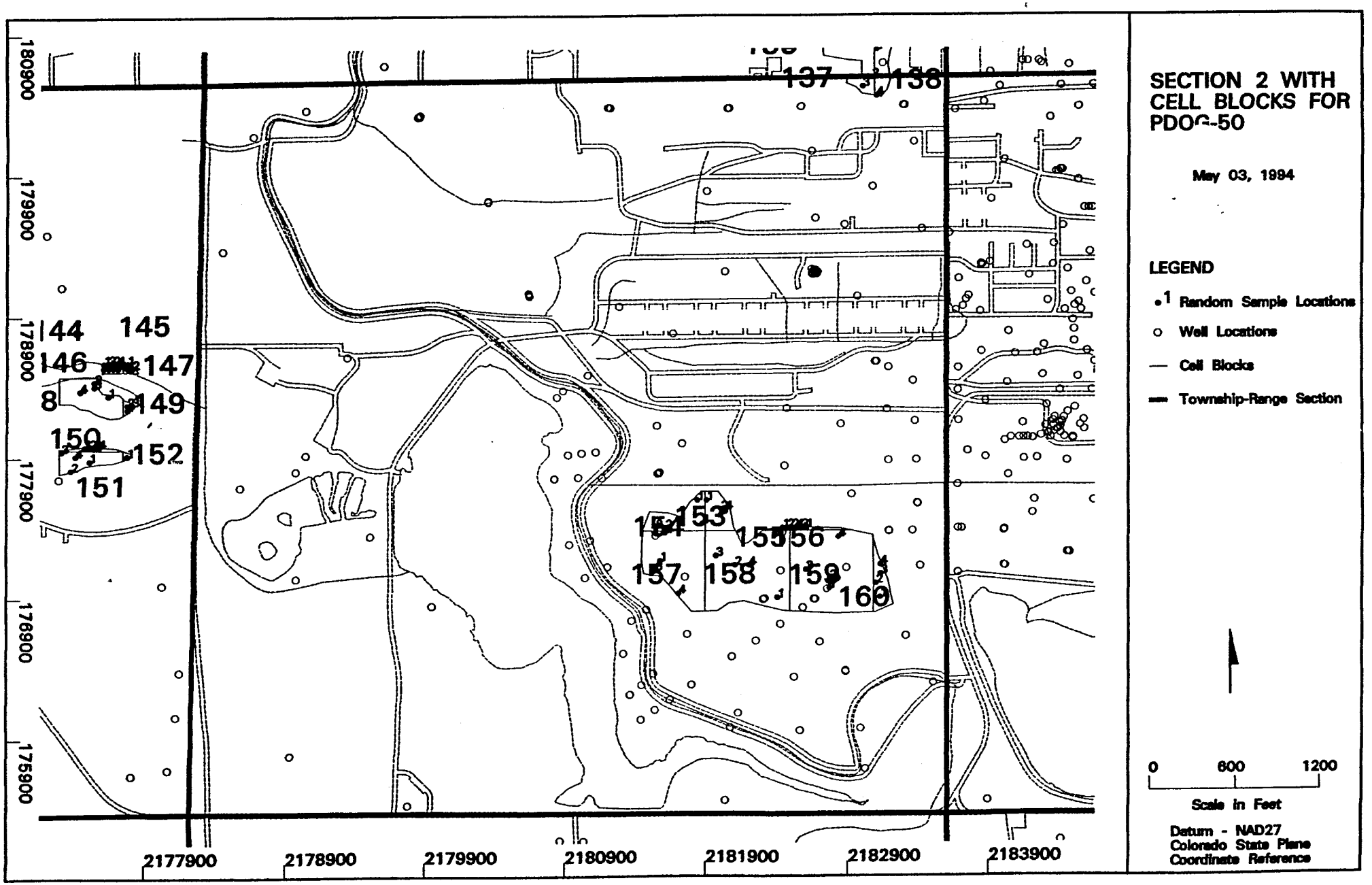


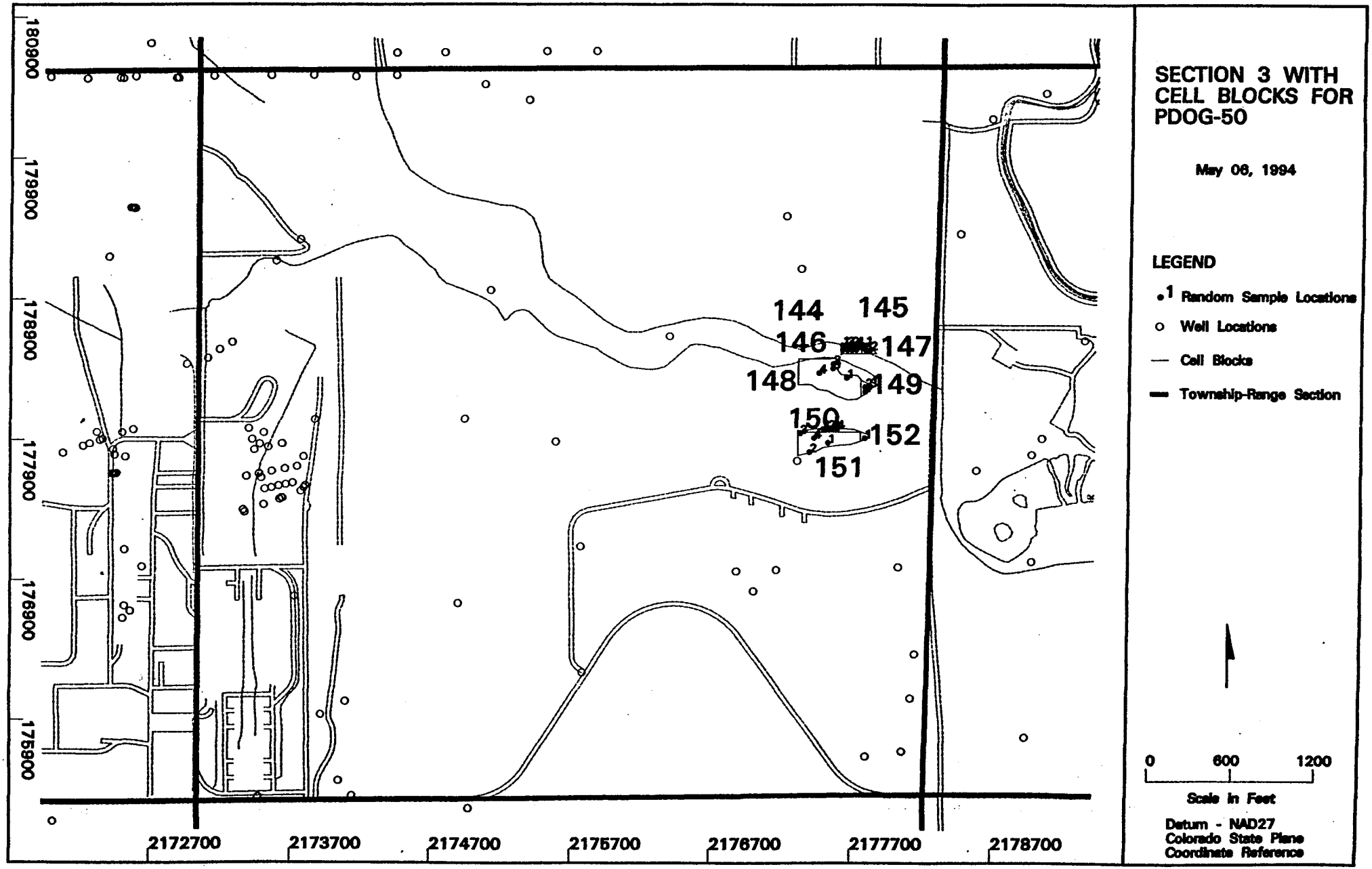
Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

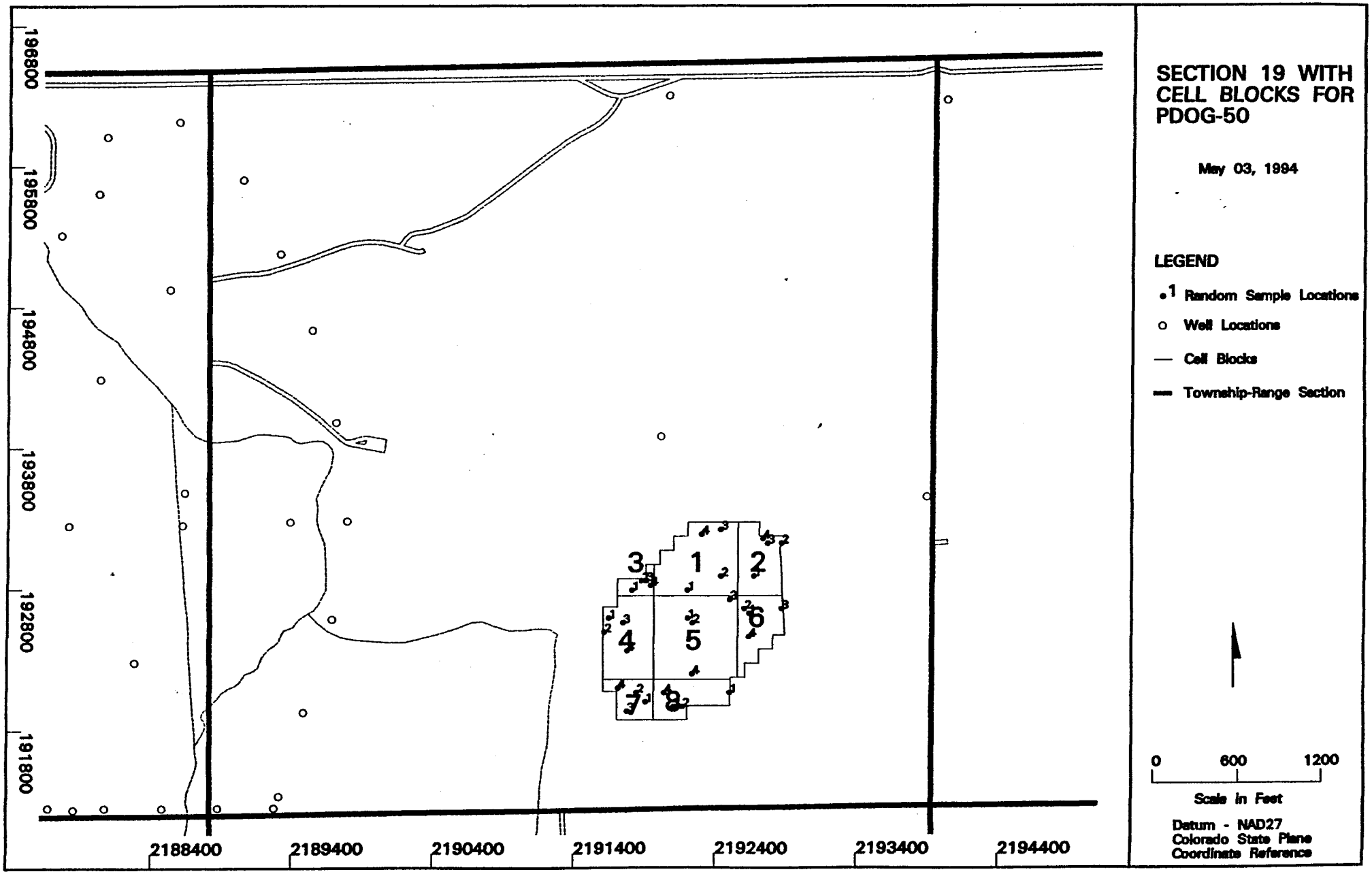
April 1994

Prairie dog block map with 50 numbered blocks covering April 1993 prairie dog towns within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


SECTION 2 WITH CELL BLOCKS FOR PDOC-50
May 03, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
180900
179900
178900
177900
176900
175900
2177900
2178900
2179900
2180900
2181900
2182900
2183900
137
138
144
145
146
147
8
149
150
152
151
153
155
156
157
158
159
160


180800
179800
178800
177800
176800
175800
2172700
2173700
2174700
2175700
2176700
2177700
2178700
144
145
146
147
148
149
150
151
152
SECTION 3 WITH CELL BLOCKS FOR PDOG-50
May 08, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 19 WITH CELL BLOCKS FOR PDOG-50

May 03, 1994

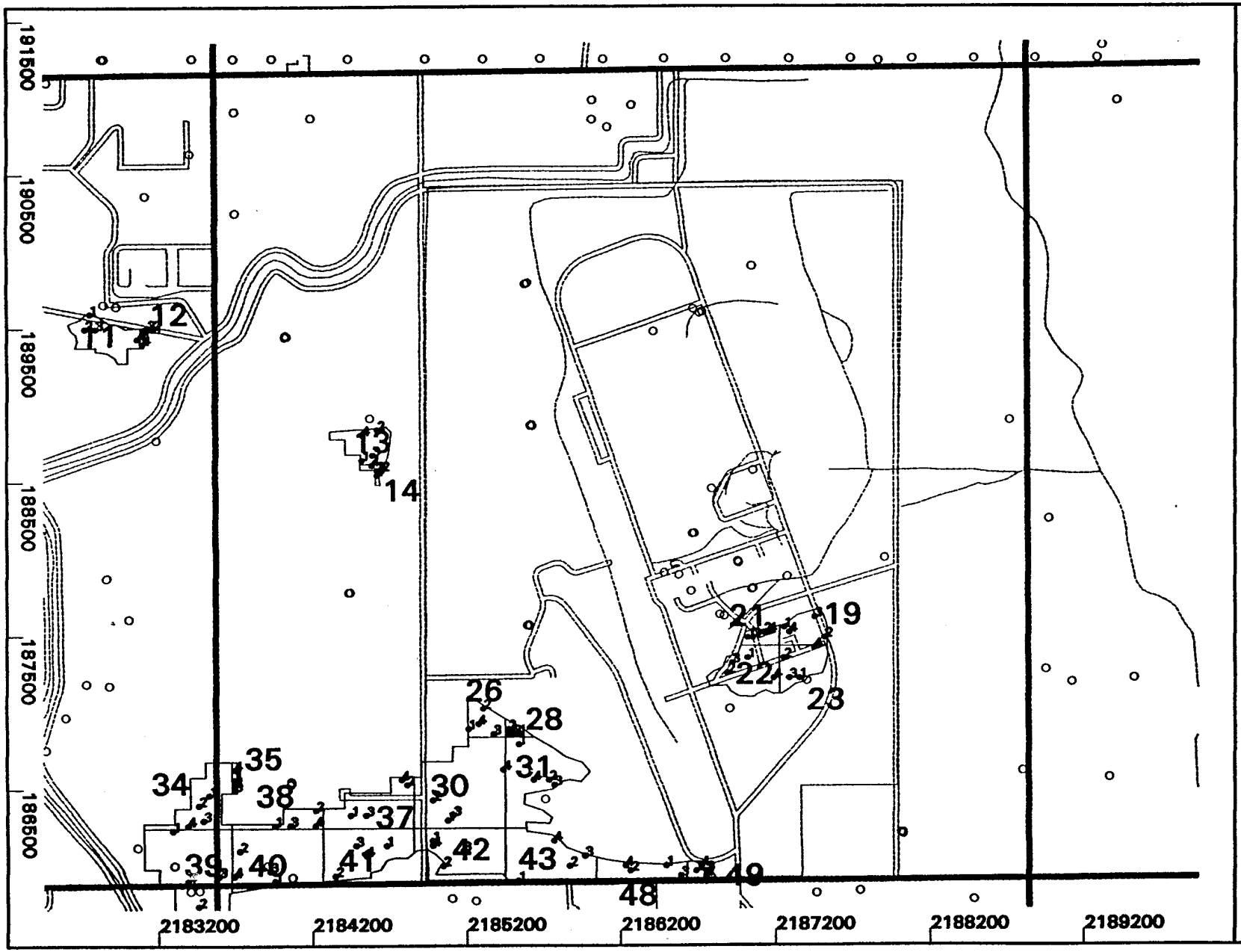
LEGEND

- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

0 600 1200

Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 25 WITH CELL BLOCKS FOR PDOG-50

May 03, 1994

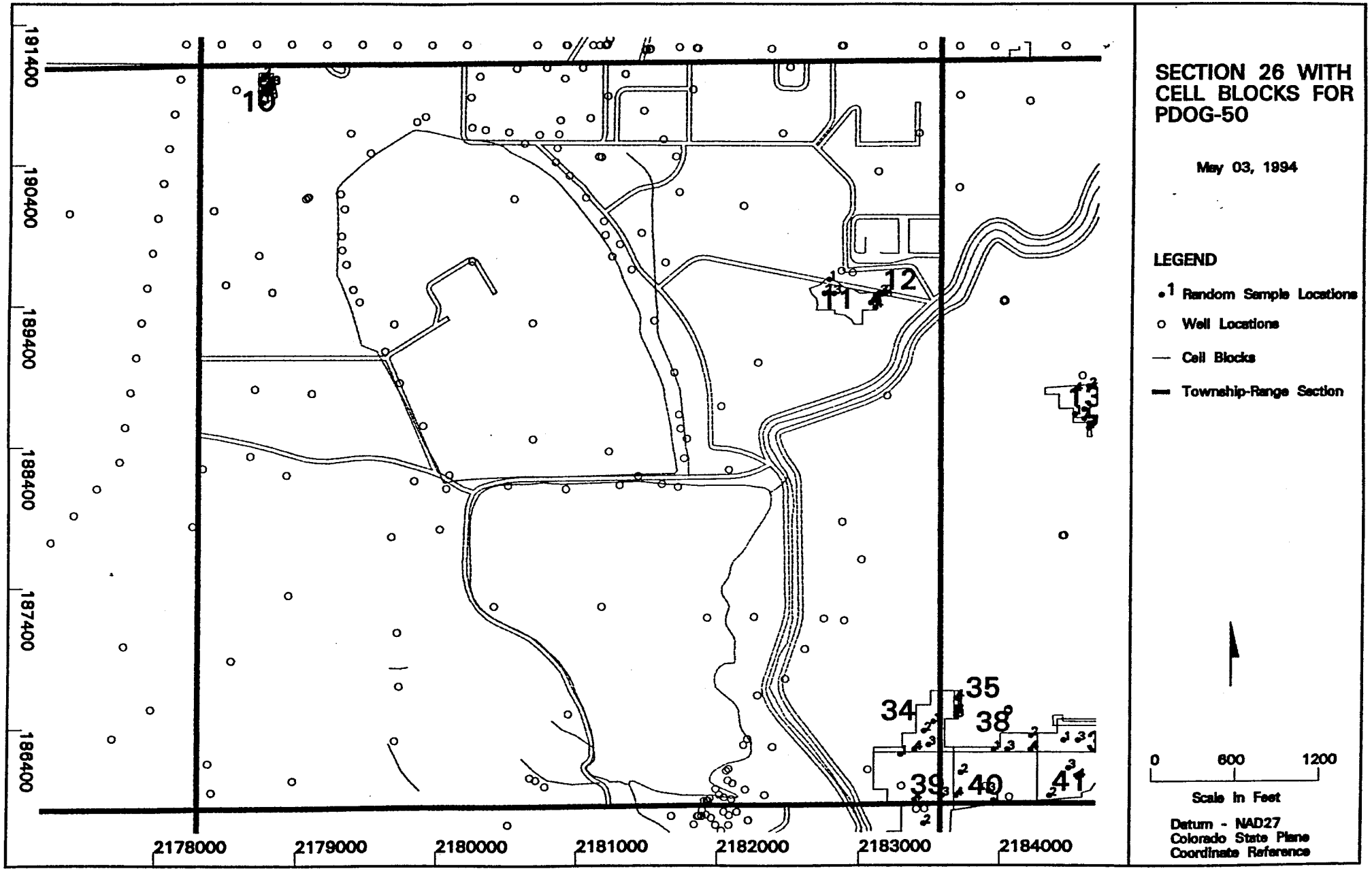
LEGEND

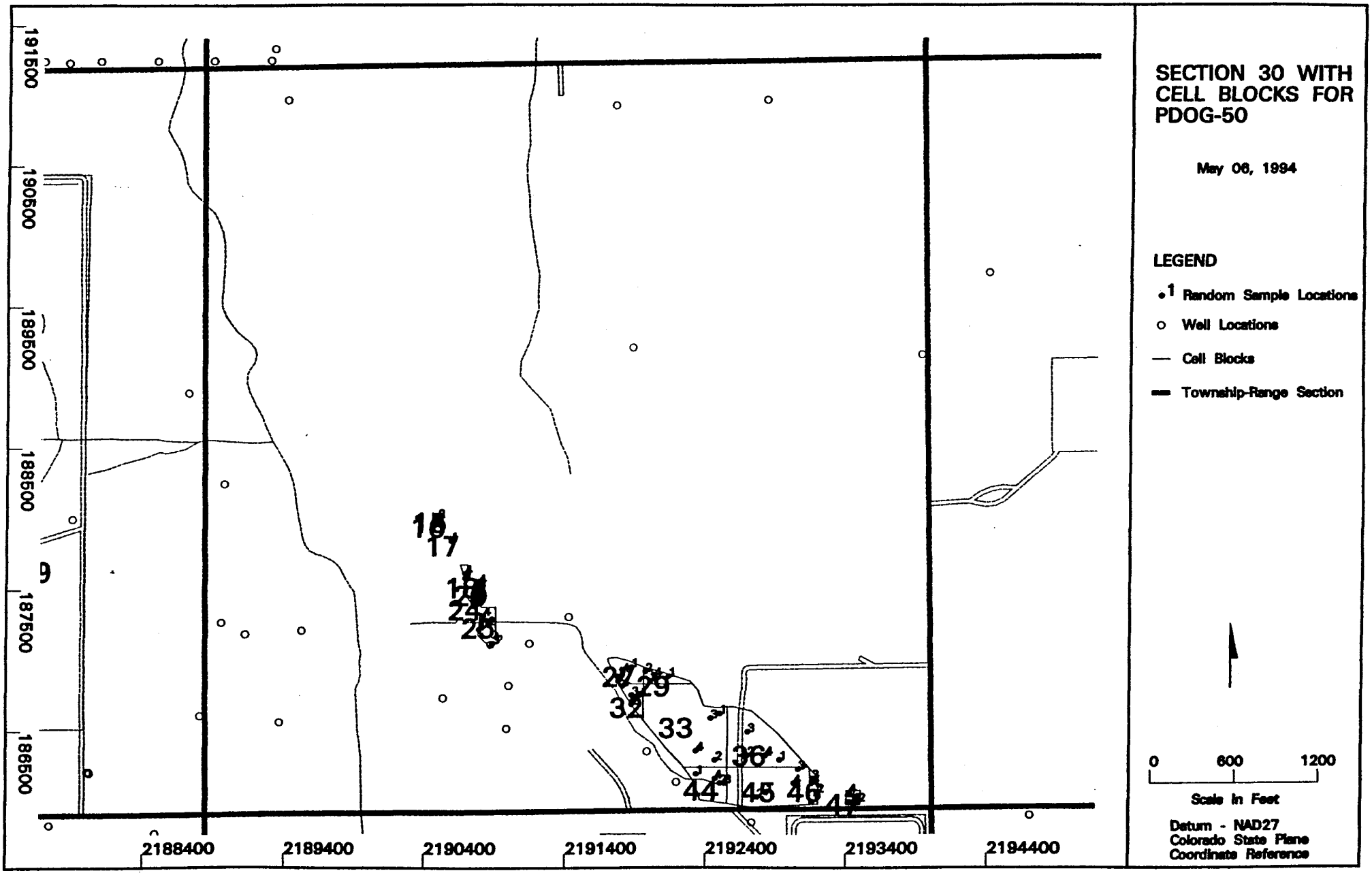
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ═ Township-Range Section

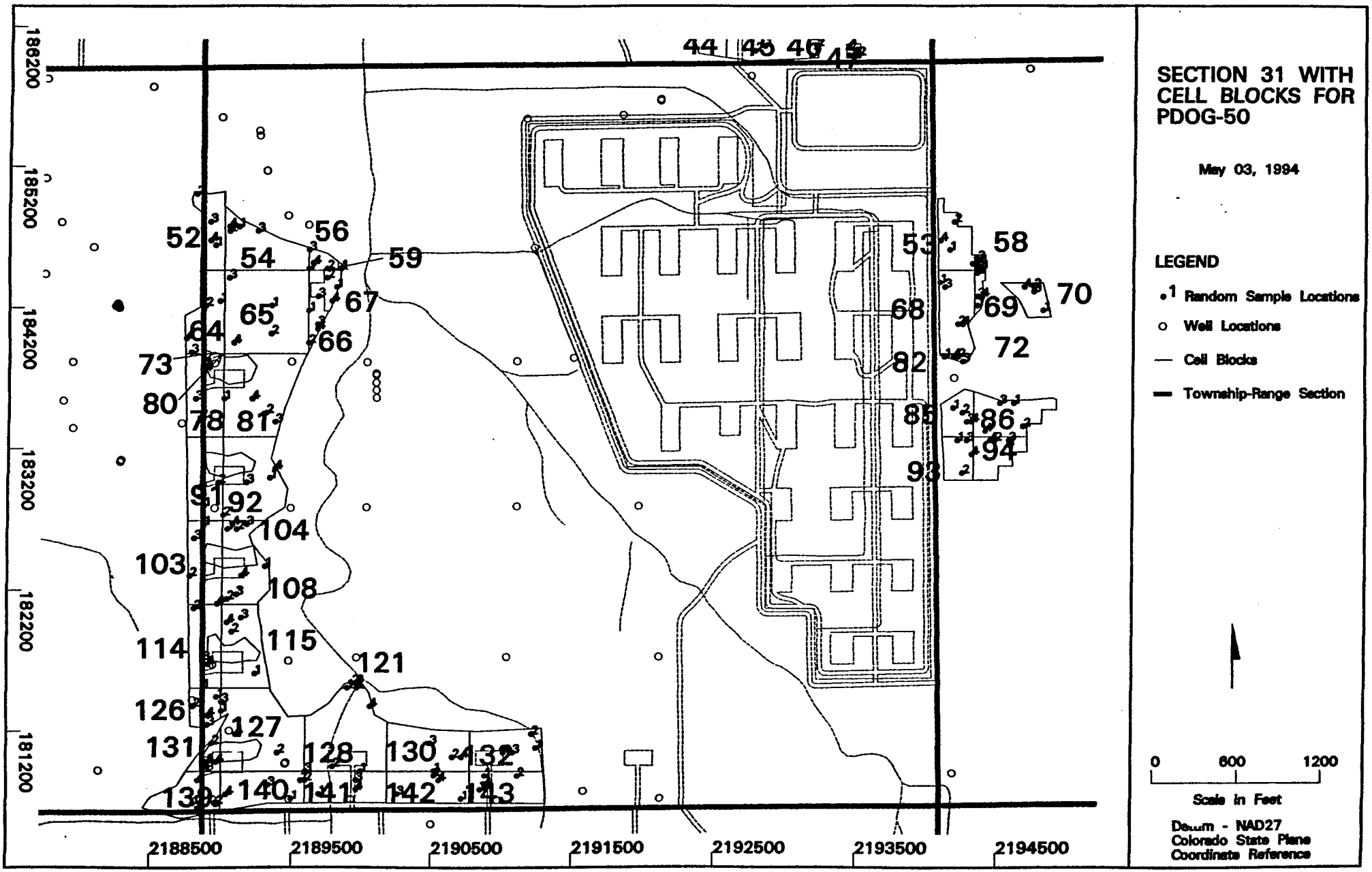
0 600 1200

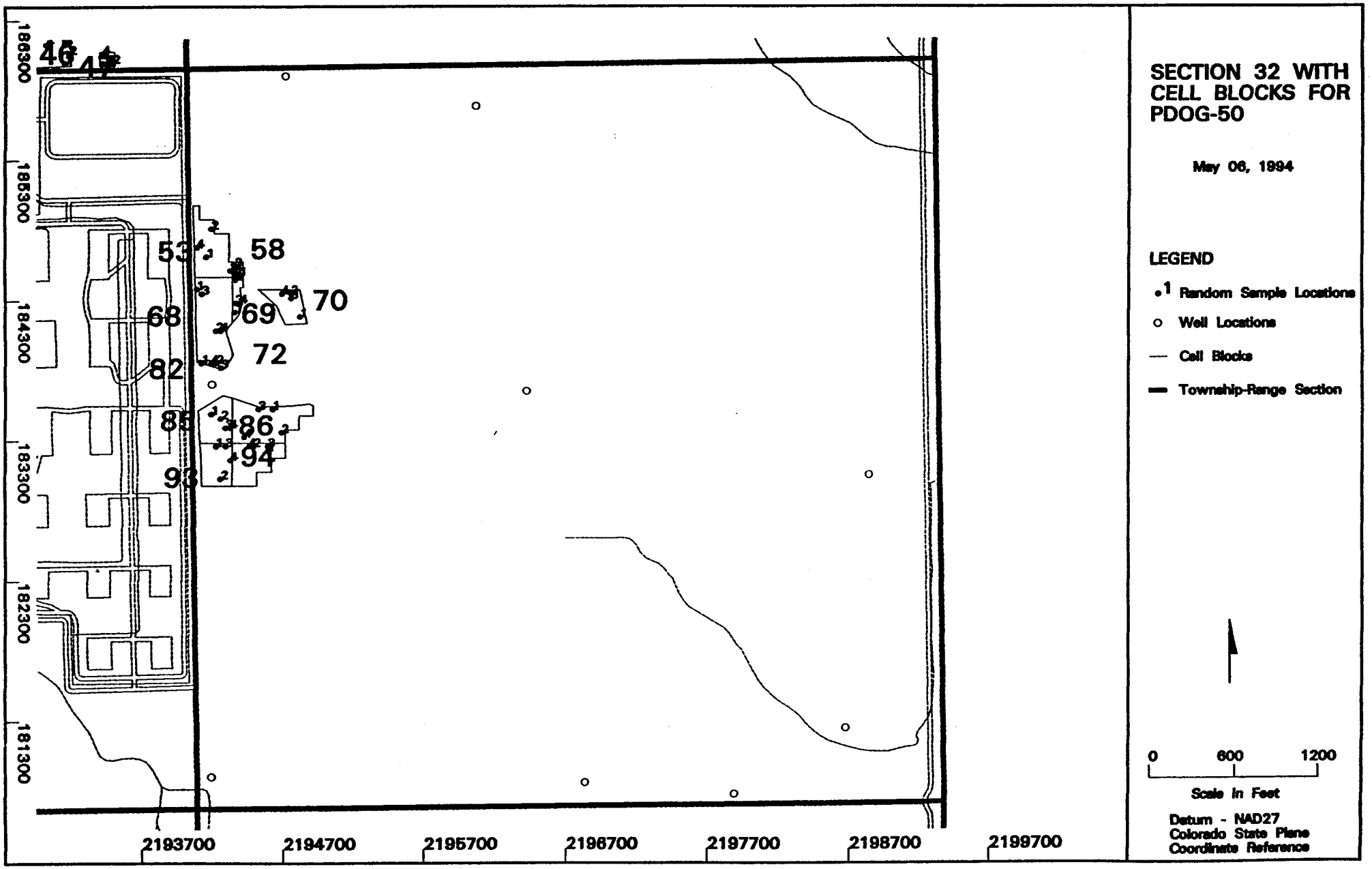
Scale In Feet

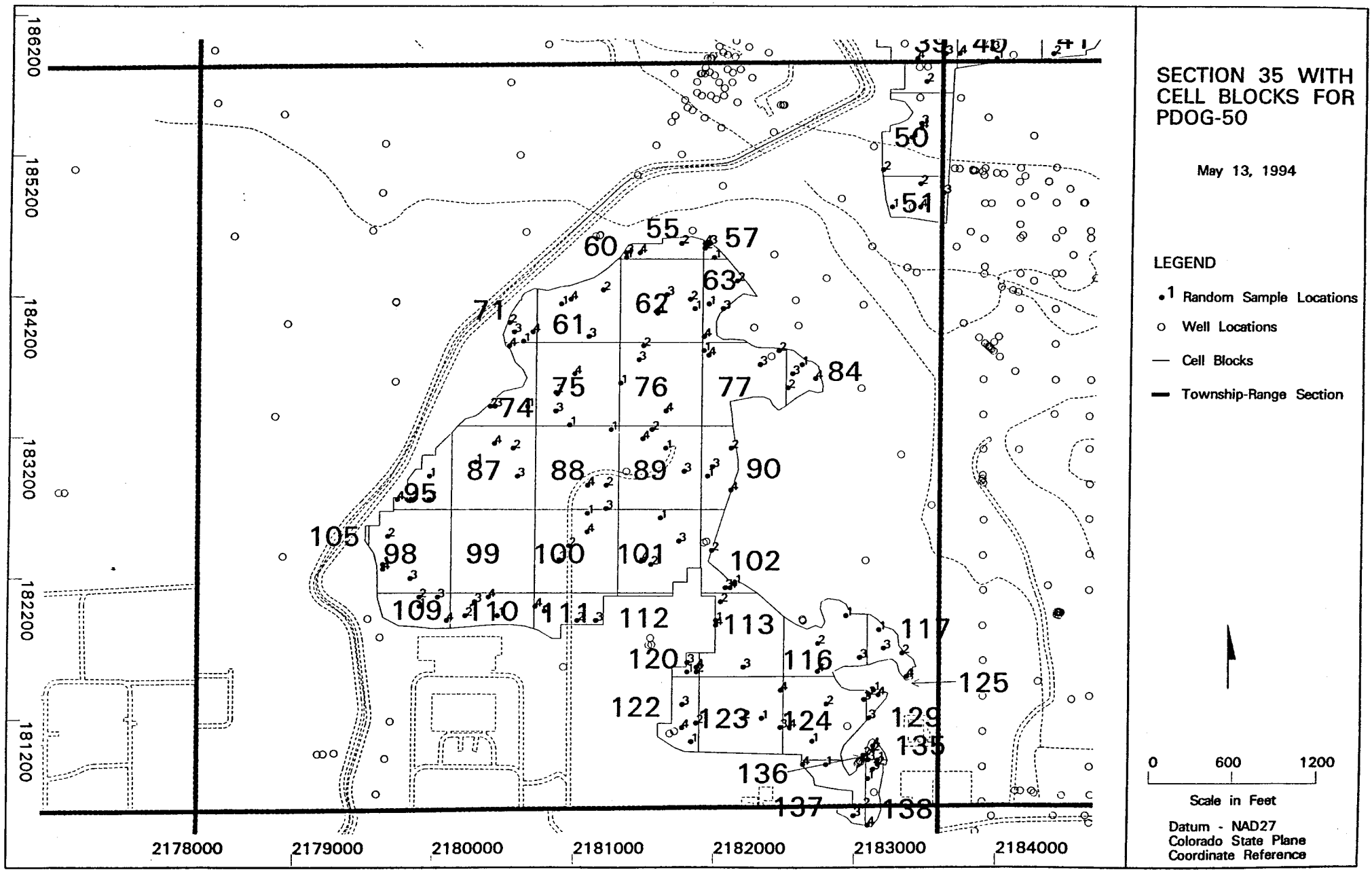
Datum - NAD27
Colorado State Plane
Coordinate Reference

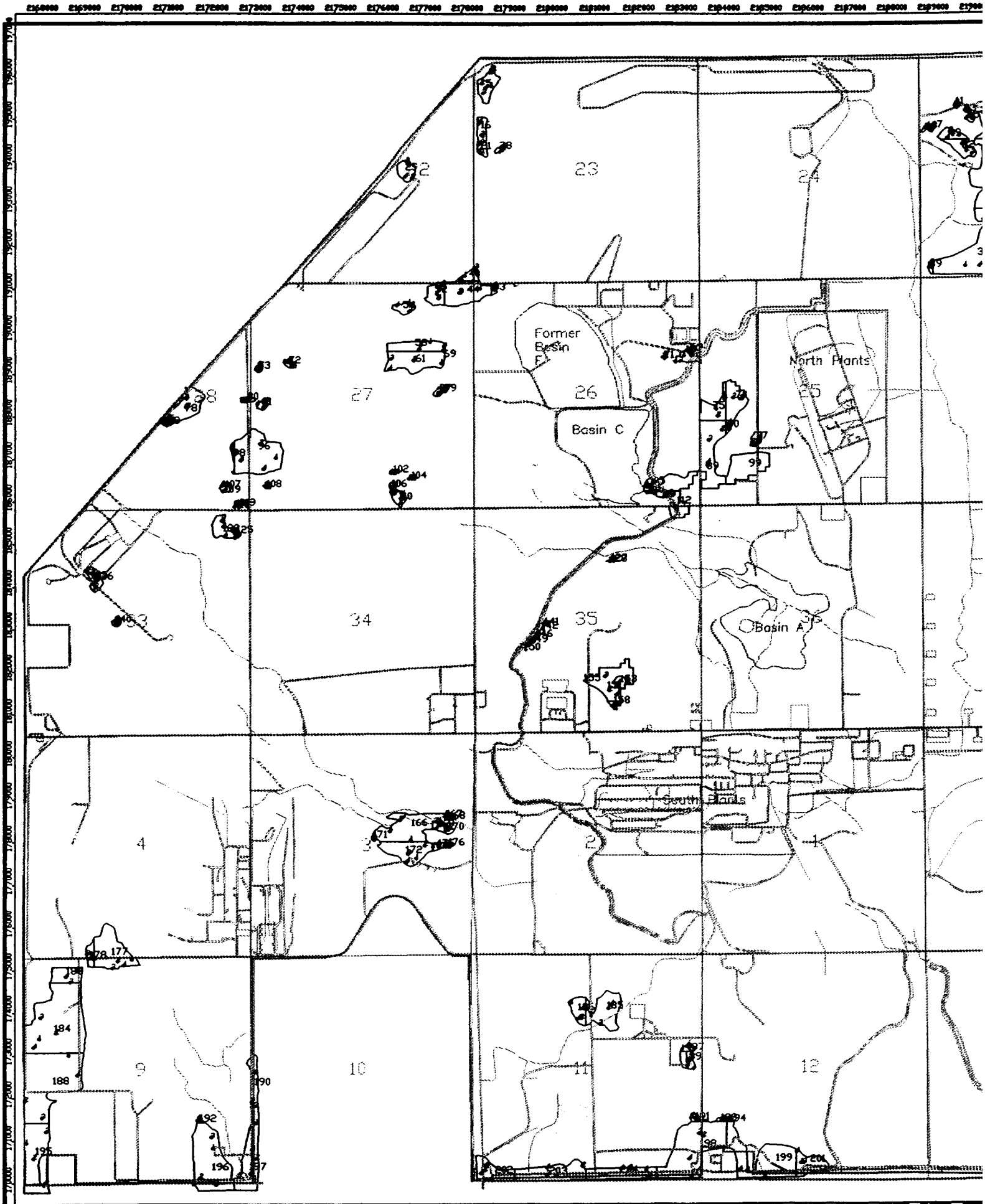

191400
190400
189400
188400
187400
186400
2178000
2179000
2180000
2181000
2182000
2183000
2184000
10
11
12
34
35
38
39
40
41
SECTION 26 WITH CELL BLOCKS FOR PDOG-50
May 03, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale In Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

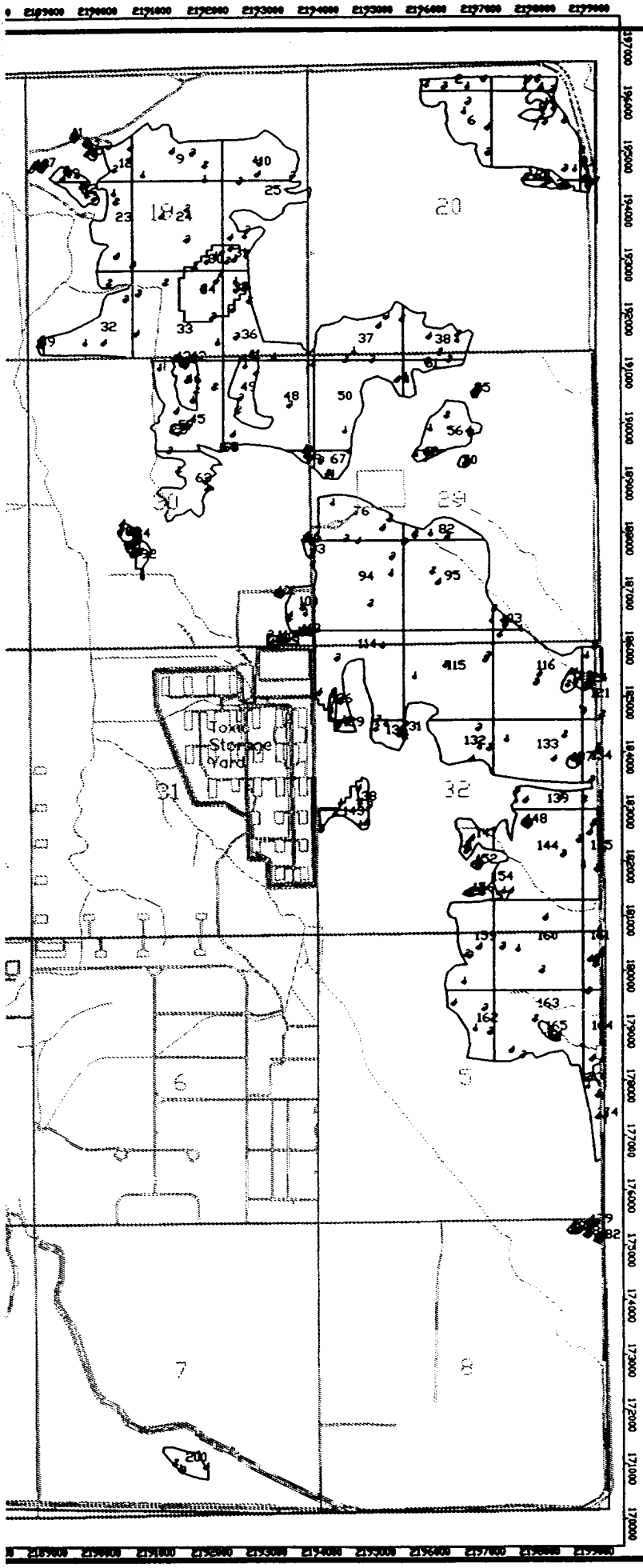

191500
190500
189500
188500
187500
186500
2188400
2189400
2190400
2191400
2192400
2193400
2194400
SECTION 30 WITH CELL BLOCKS FOR PDOG-50
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 31 WITH CELL BLOCKS FOR PDOG-50
May 03, 1994
LEGEND
•1 Random Sample Locations
o Well Locations
— Cell Blocks
— Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
186200
185200
184200
183200
182200
181200
2188500
2189500
2190500
2191500
2192500
2193500
2194500
44 45 46 47
52 54 56 59 65 67 64 66 73 80 78 81
53 58 68 69 70 72 82 85 86 94 93
91 92 104 103 108 114 115 121 126 127 131 128 130 132 139 140 141 142 143


186300
185300
184300
183300
182300
181300
53
58
68
69
70
72
82
85
86
93
94
2193700
2194700
2195700
2196700
2197700
2198700
2199700
SECTION 32 WITH CELL BLOCKS FOR PDOG-50
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale In Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 35 WITH CELL BLOCKS FOR PDOG-50
May 13, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
186200
185200
184200
183200
182200
181200
2178000
2179000
2180000
2181000
2182000
2183000
2184000
50
51
55
57
60
63
62
71
61
84
75
76
77
74
87
88
89
90
95
105
98
99
100
101
102
109
110
111
112
113
117
120
116
125
122
123
124
129
135
136
137
138


Former Basin F
North Plants
Basin C
Basin A
South Plants
22
23
24
27
26
25
34
35
4
3
2
1
9
10
11
12



Legend

Sampling Block

Lake

31 Section Number

Section Line

-N-

0 2000 4000

Scale in Feet

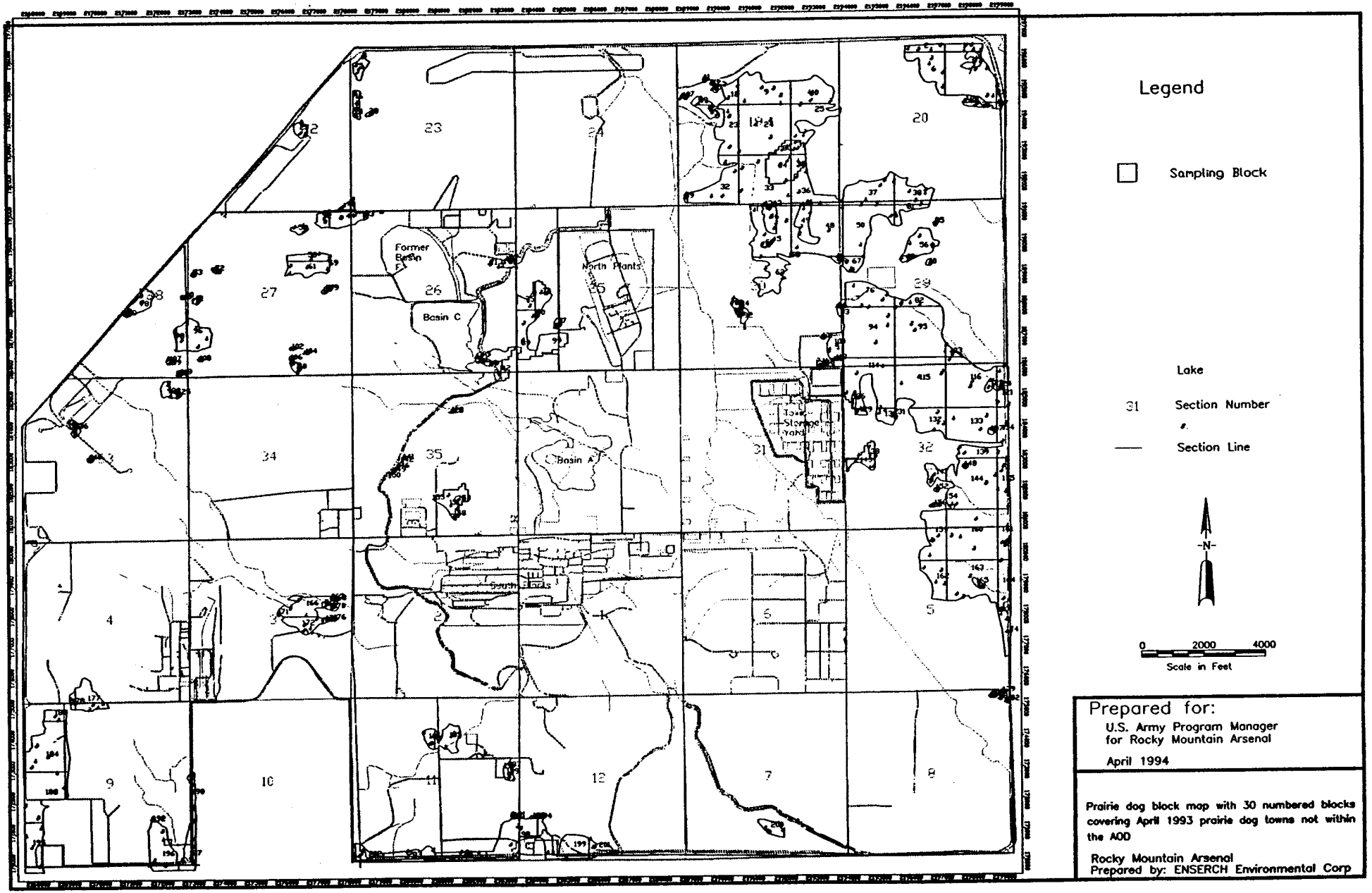
Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

April 1994

Prairie dog block map with 30 numbered blocks covering April 1993 prairie dog towns not within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp



Legend

Sampling Block

Lake

31 Section Number

Section Line

N

0 2000 4000

Scale in Feet

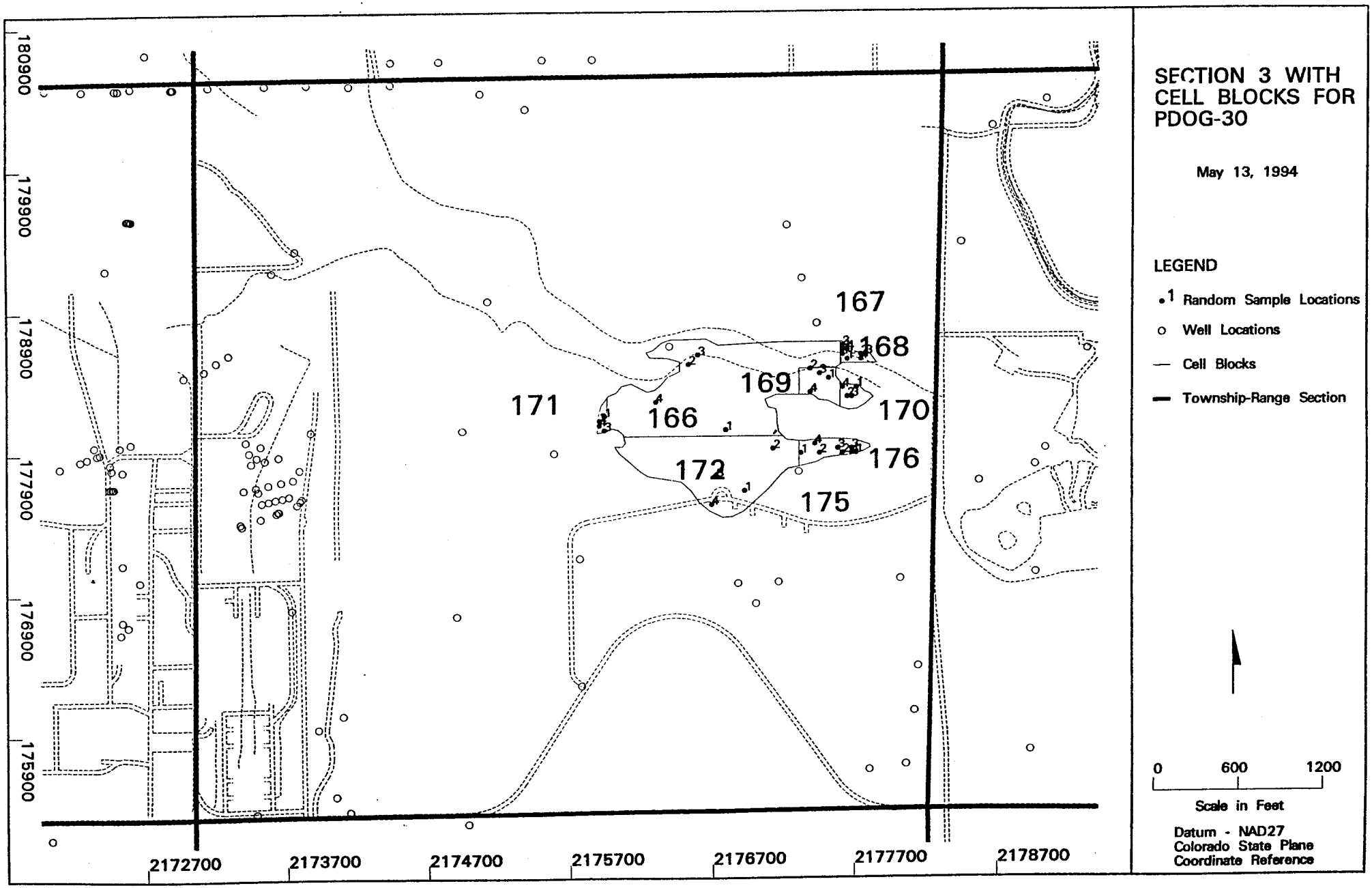
Prepared for:

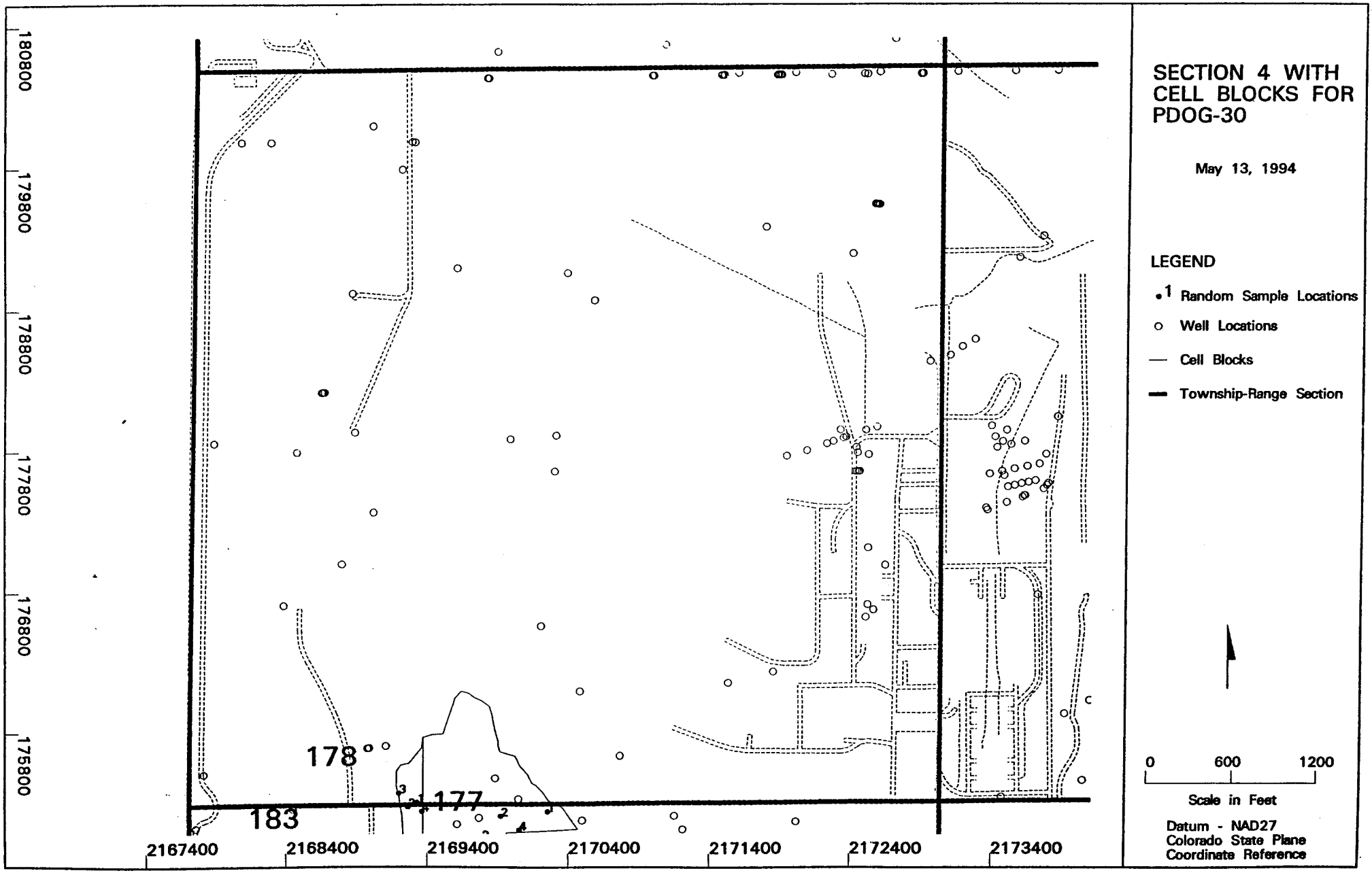
U.S. Army Program Manager
for Rocky Mountain Arsenal

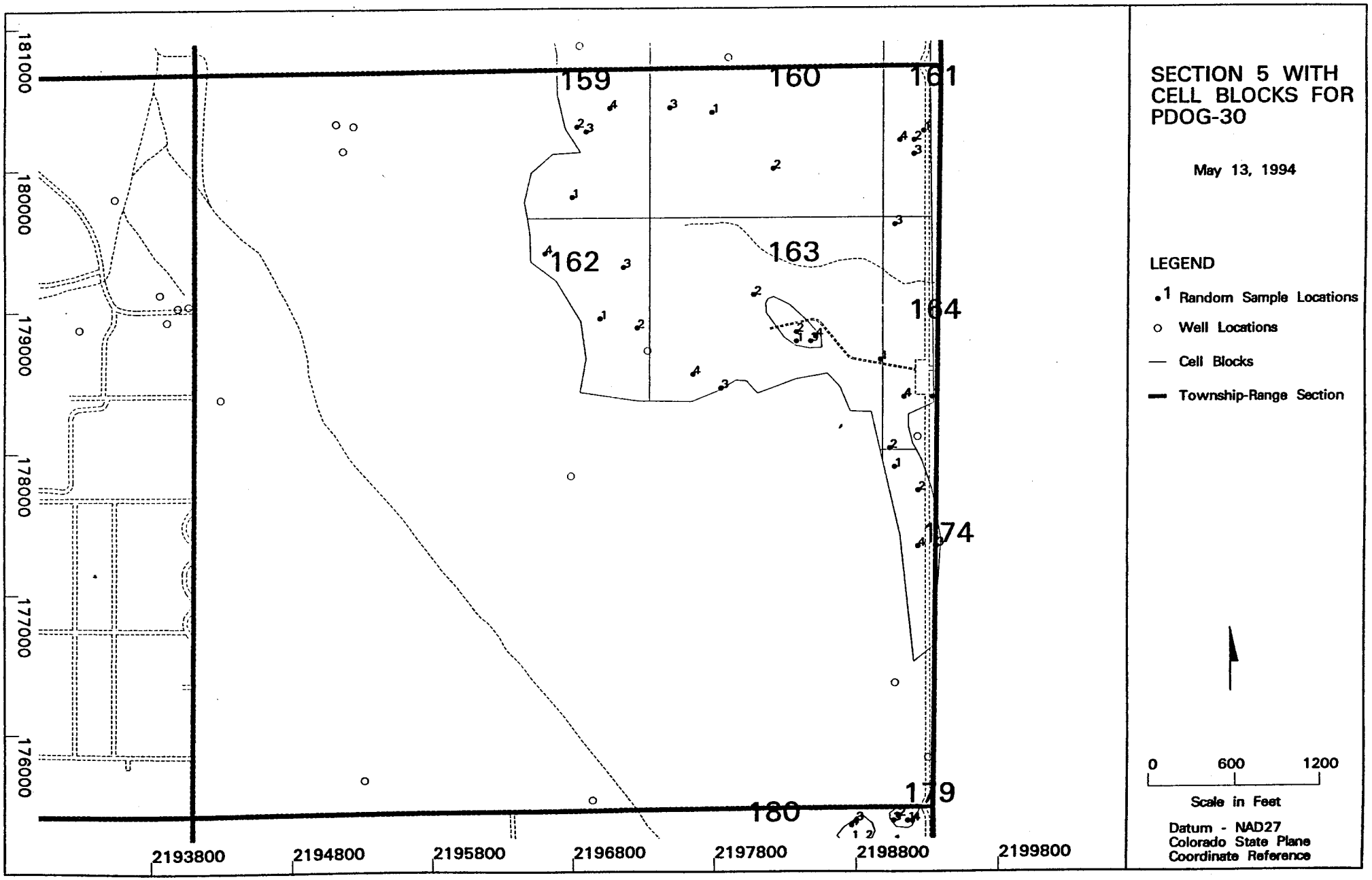
April 1994

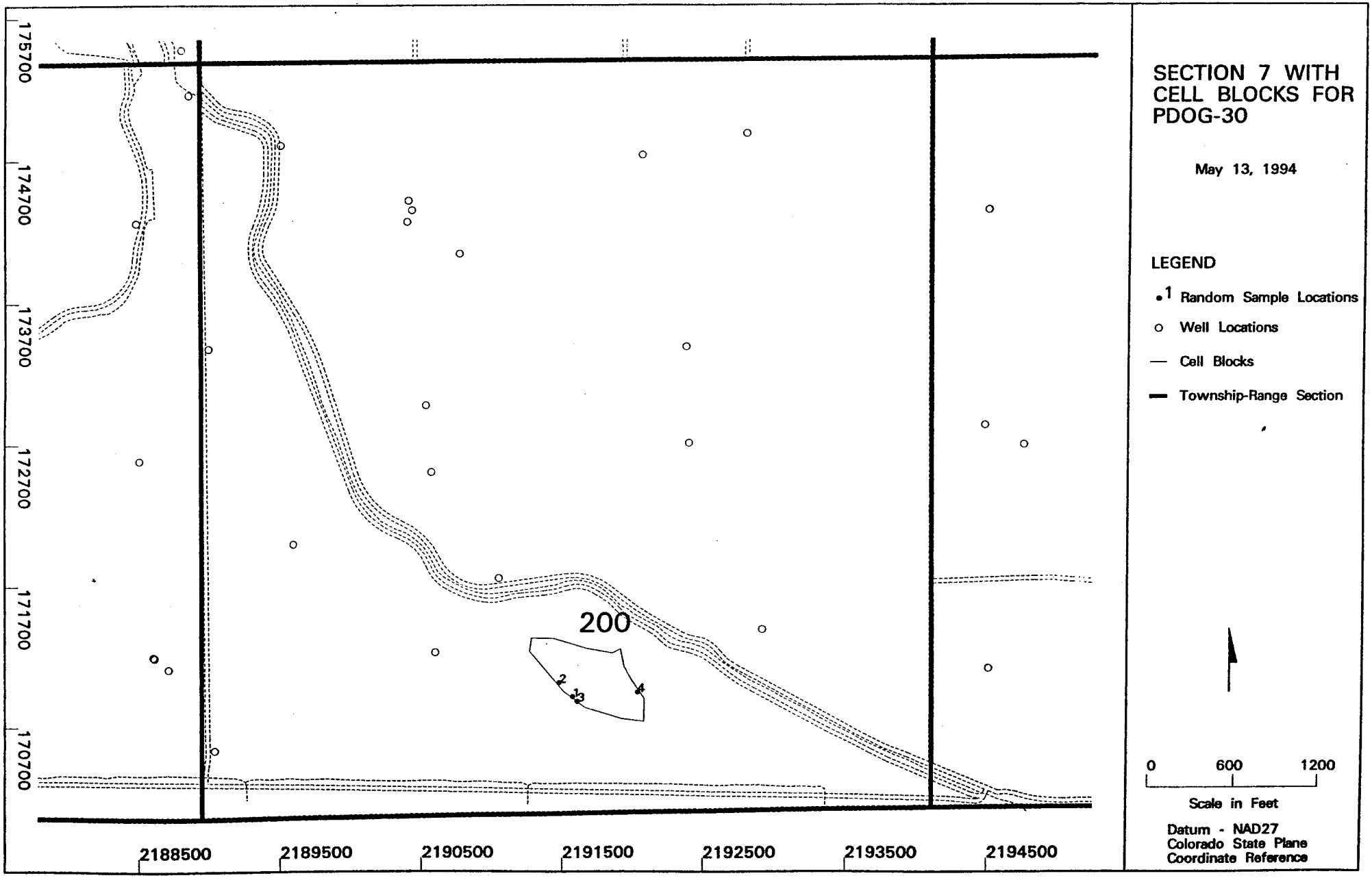
Prairie dog block map with 30 numbered blocks covering April 1993 prairie dog towns not within the AOD

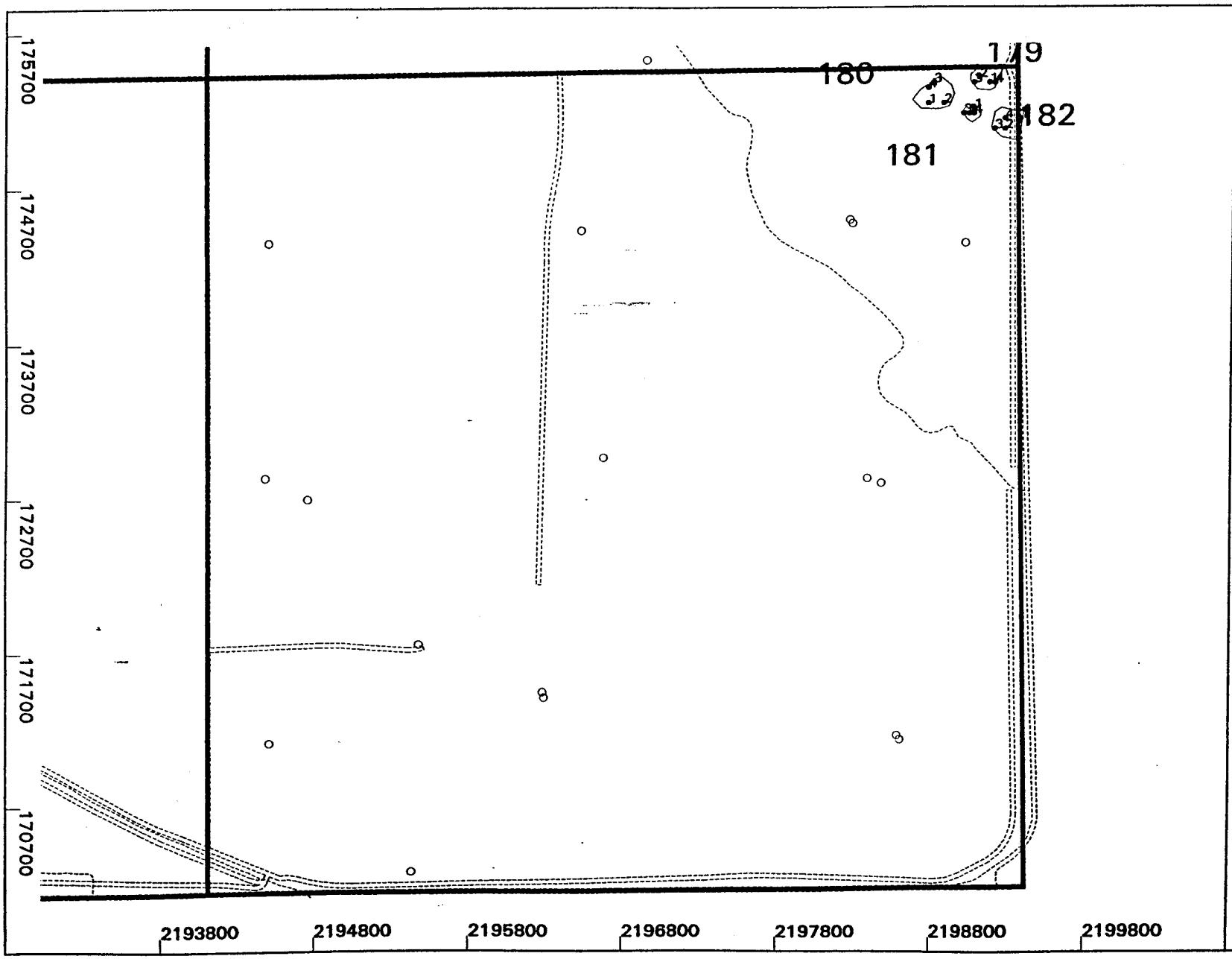
Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


SECTION 3 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
167
168
169
170
171
166
172
175
176
180900
179900
178900
177900
176900
175900
2172700
2173700
2174700
2175700
2176700
2177700
2178700
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


180800
179800
178800
177800
176800
175800
178
177
183
2167400
2168400
2169400
2170400
2171400
2172400
2173400
SECTION 4 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 5 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
159
160
161
162
163
164
174
179
180
181000
180000
179000
178000
177000
176000
2193800
2194800
2195800
2196800
2197800
2198800
2199800
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


175700
174700
173700
172700
171700
170700
2188500
2189500
2190500
2191500
2192500
2193500
2194500
200
1
2
3
4
SECTION 7 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 8 WITH CELL BLOCKS FOR PDOG-30

May 13, 1994

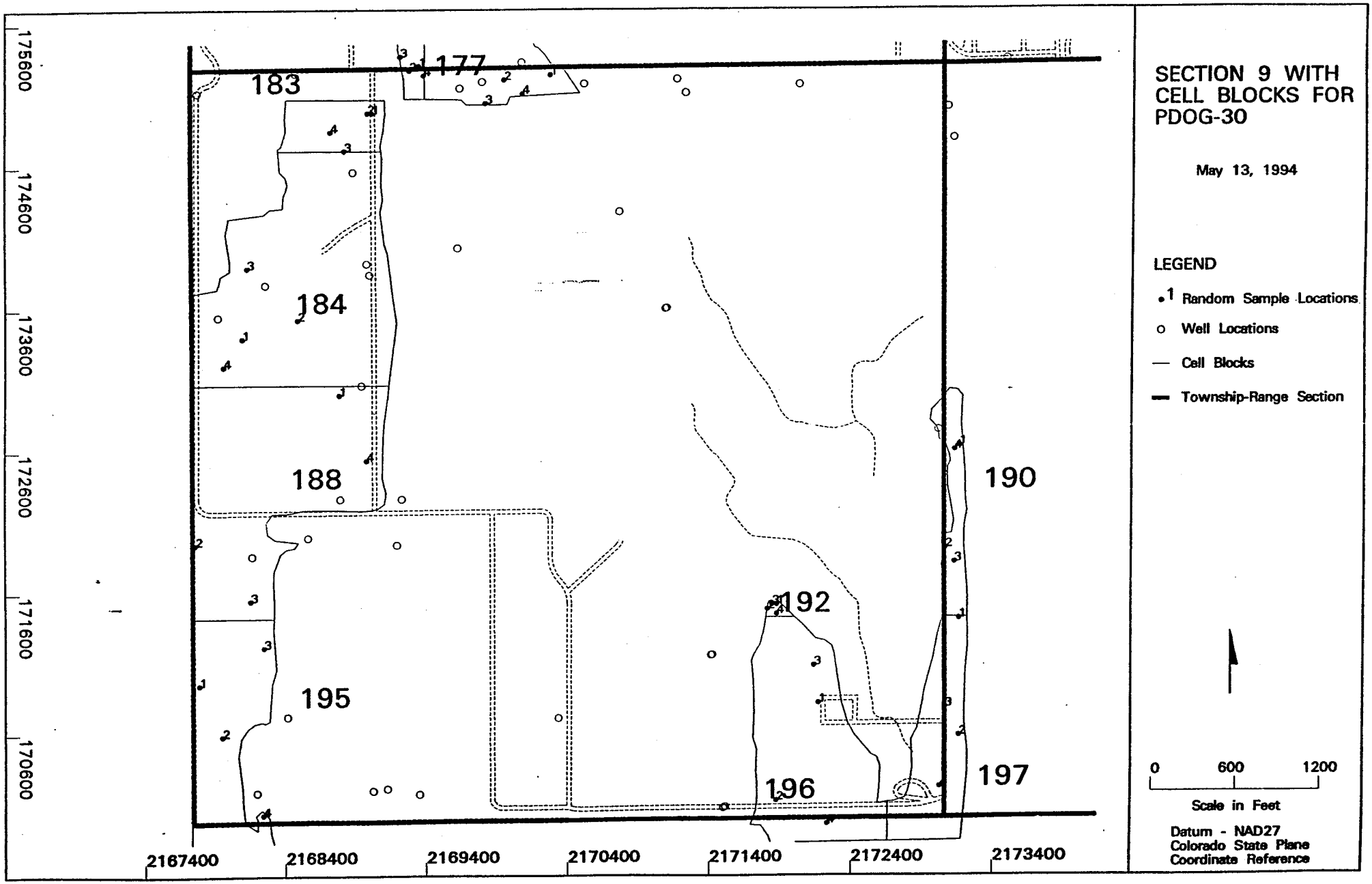
LEGEND

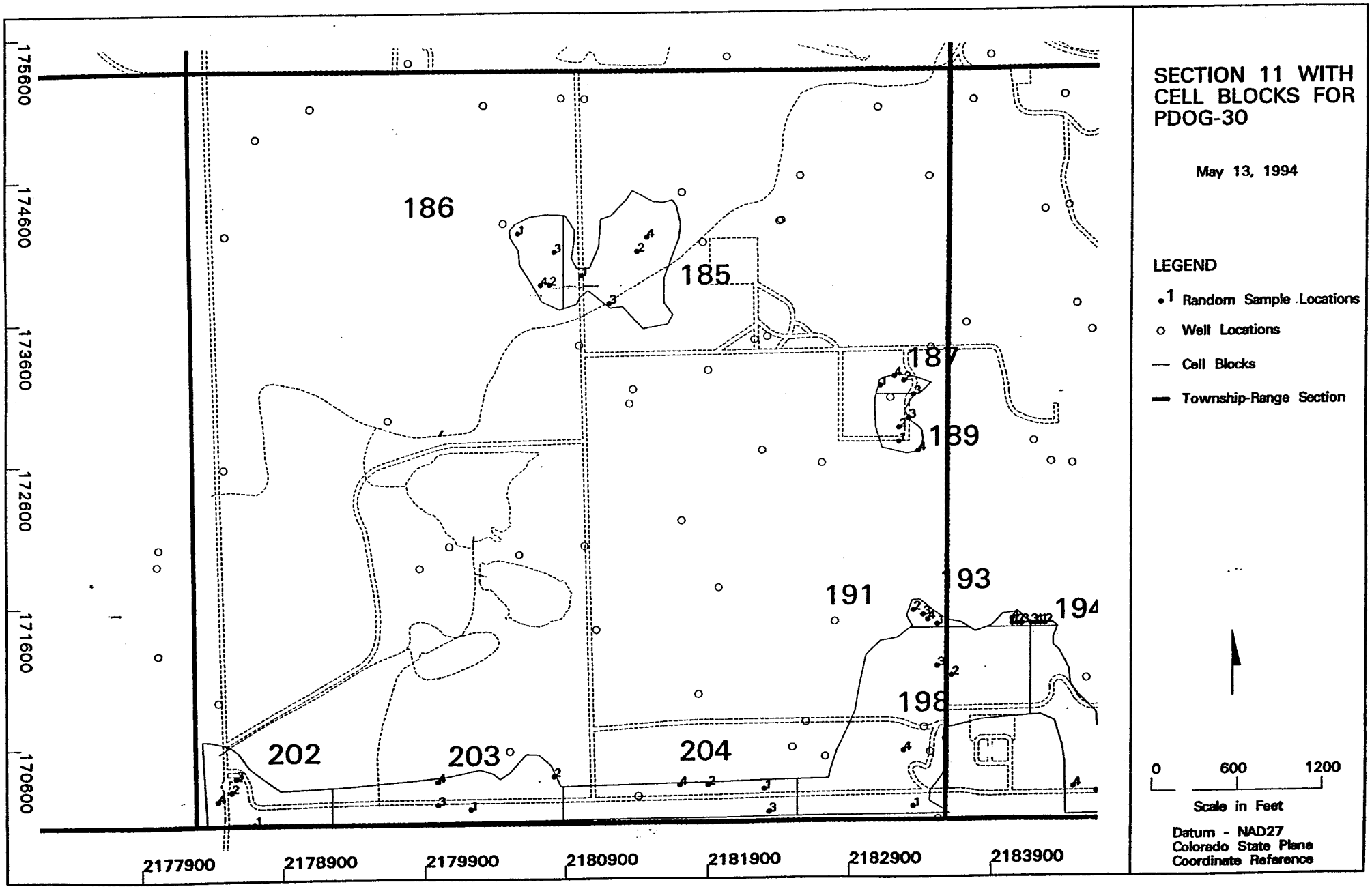
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

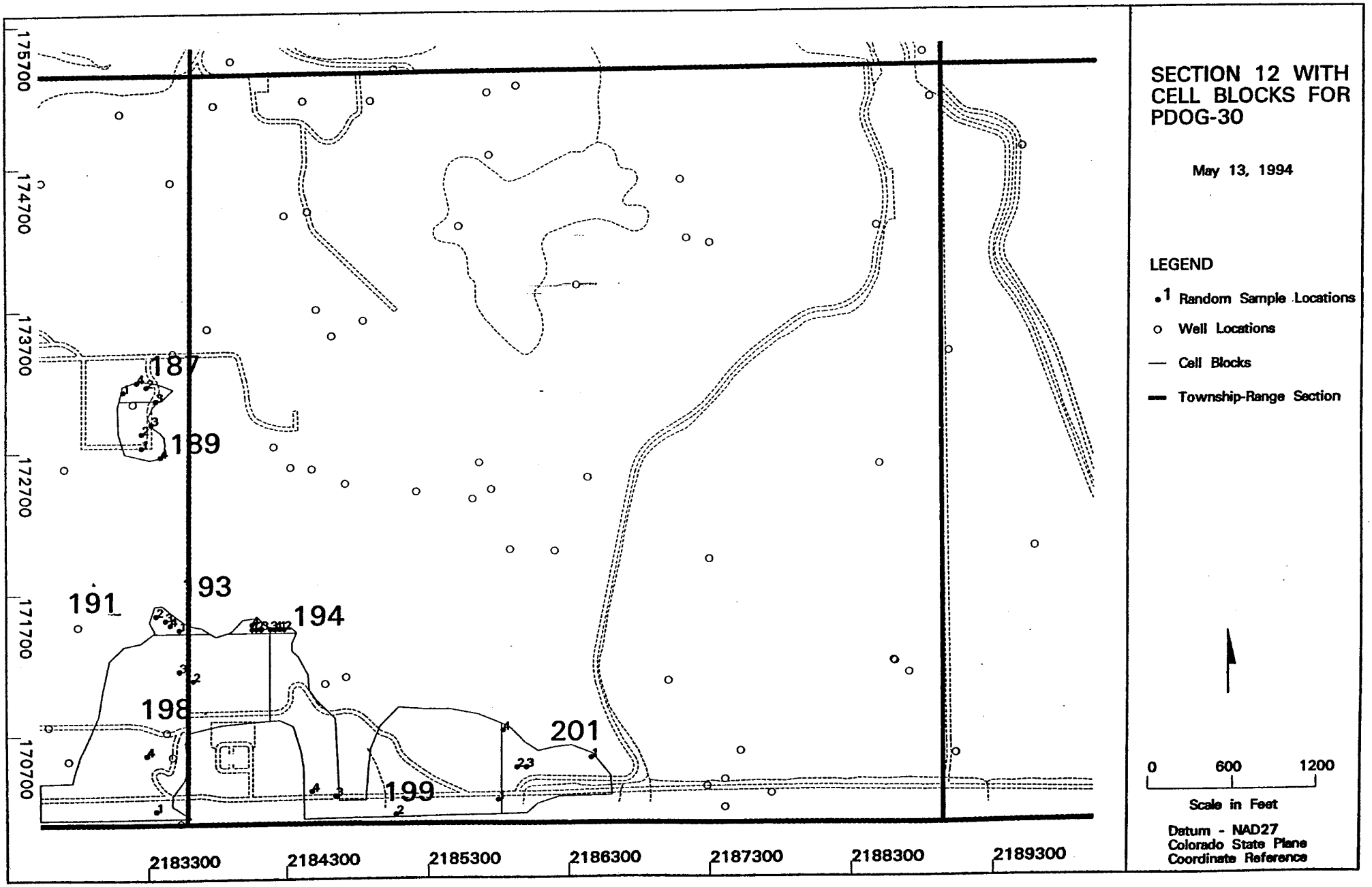
0 600 1200

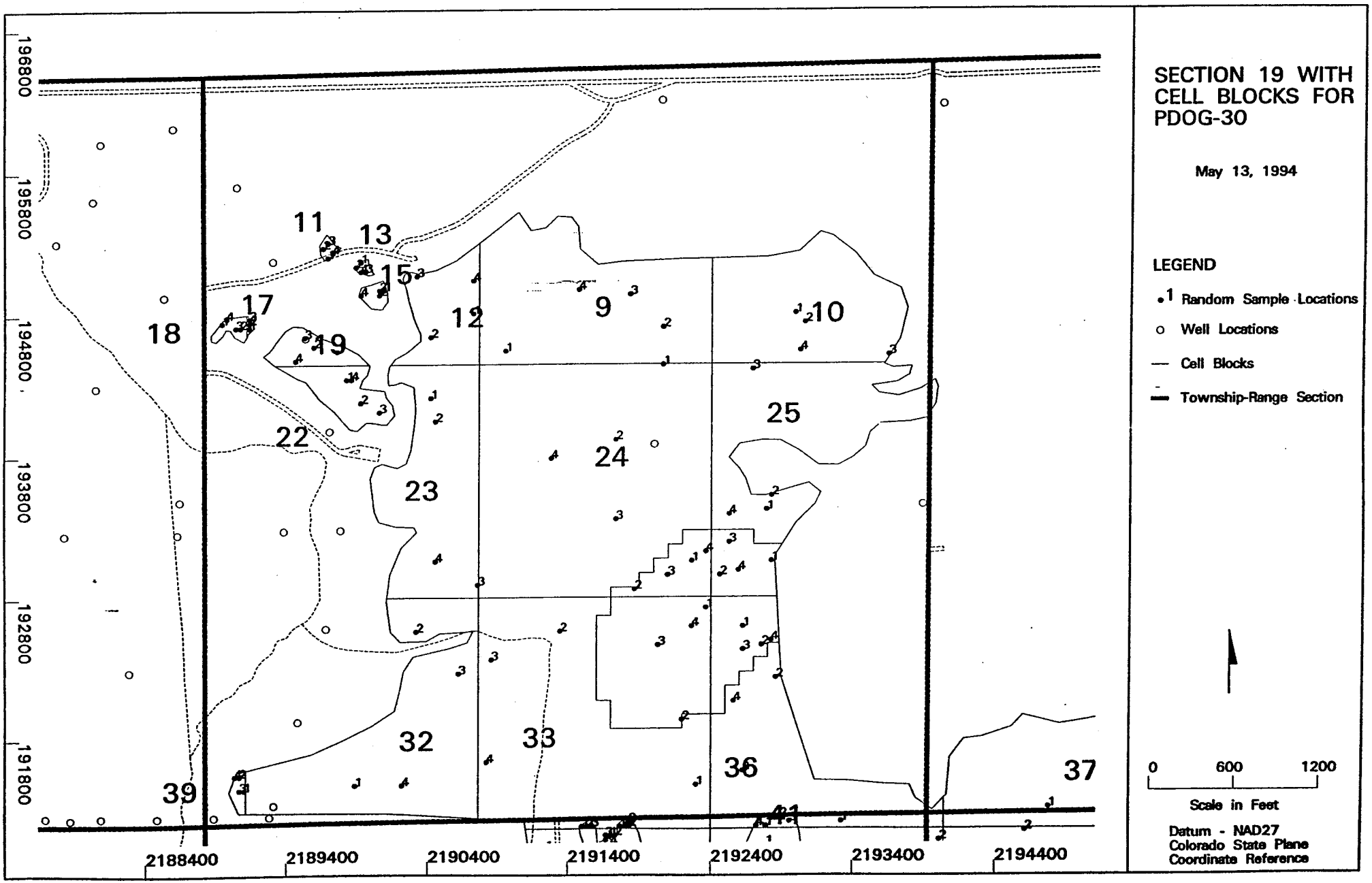
Scale in Feet

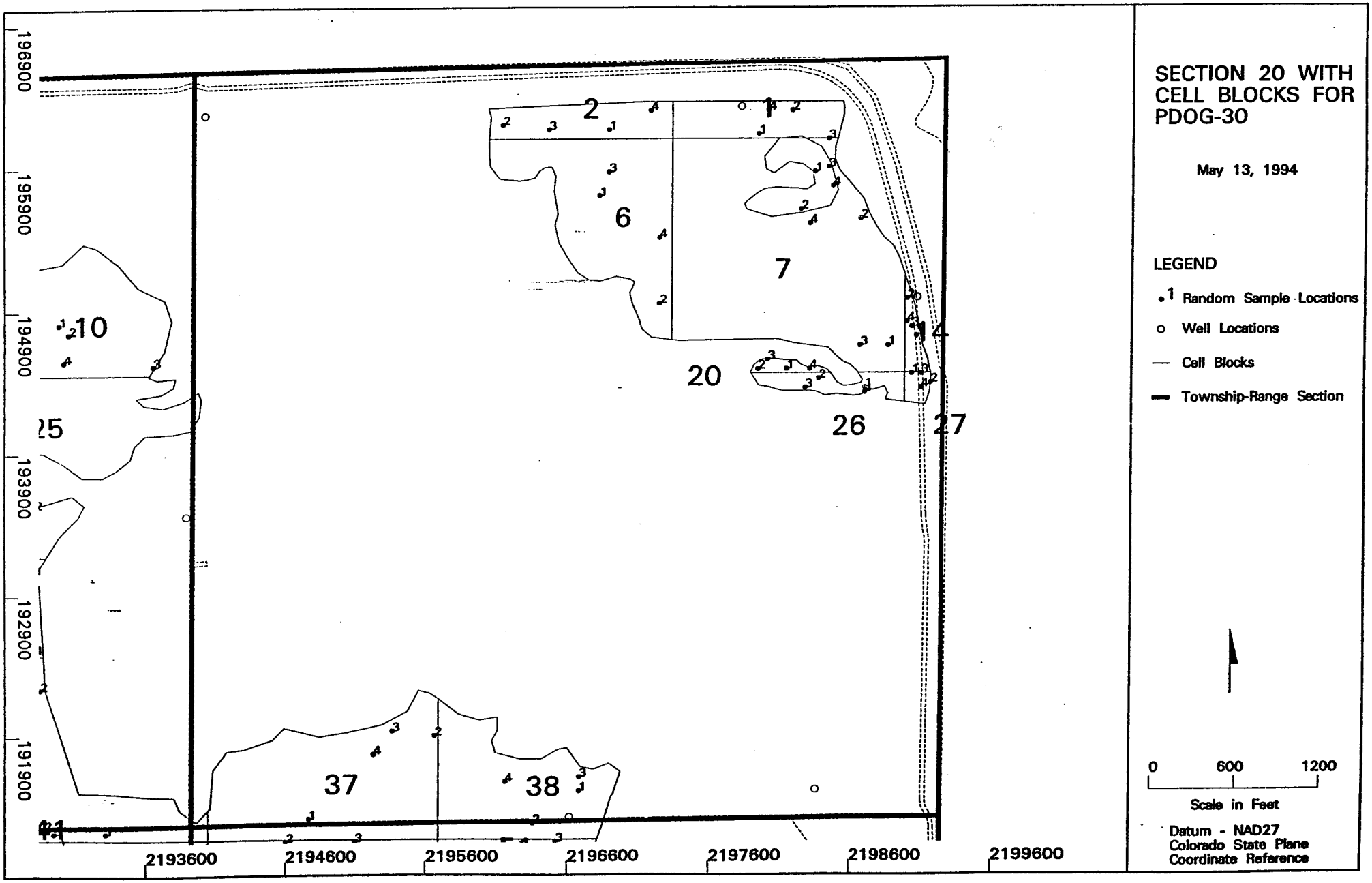
Datum - NAD27
Colorado State Plane
Coordinate Reference

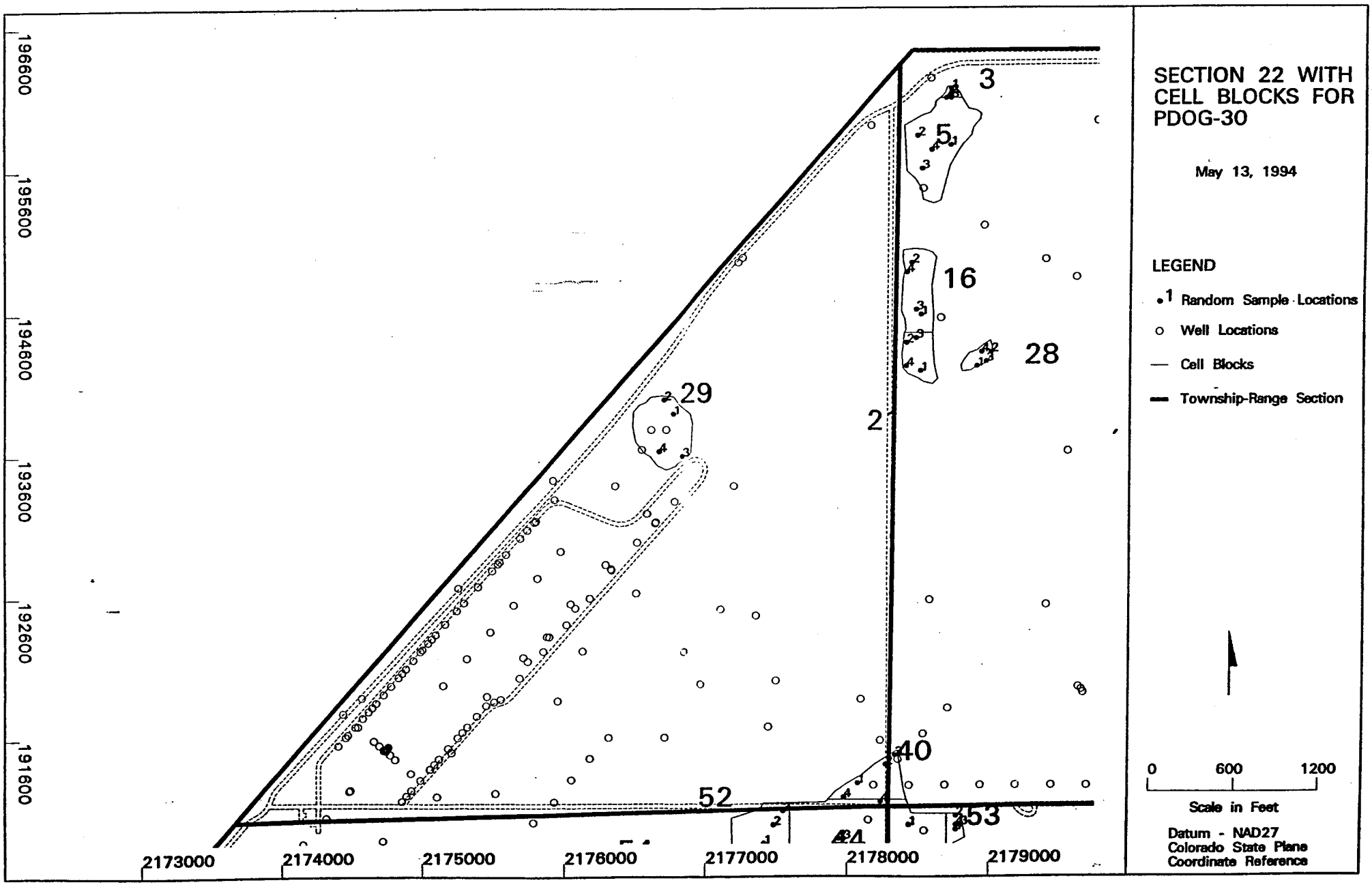

SECTION 9 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
183
177
184
188
190
192
195
196
197
175600
174600
173600
172600
171600
170600
2167400
2168400
2169400
2170400
2171400
2172400
2173400
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

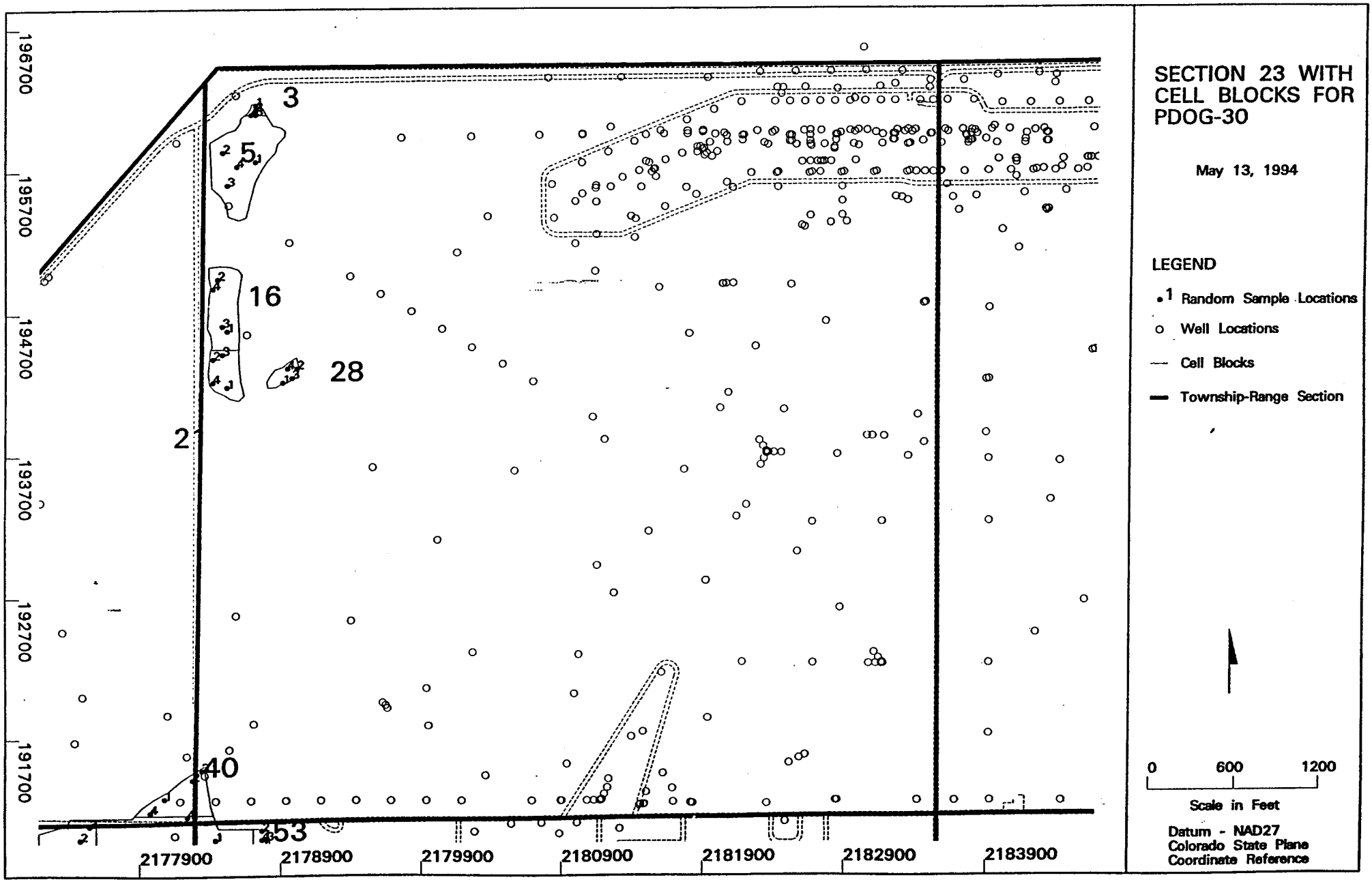

SECTION 11 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
186
185
187
189
191
193
194
198
202
203
204
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
175600
174600
173600
172600
171600
170600
2177900
2178900
2179900
2180900
2181900
2182900
2183900

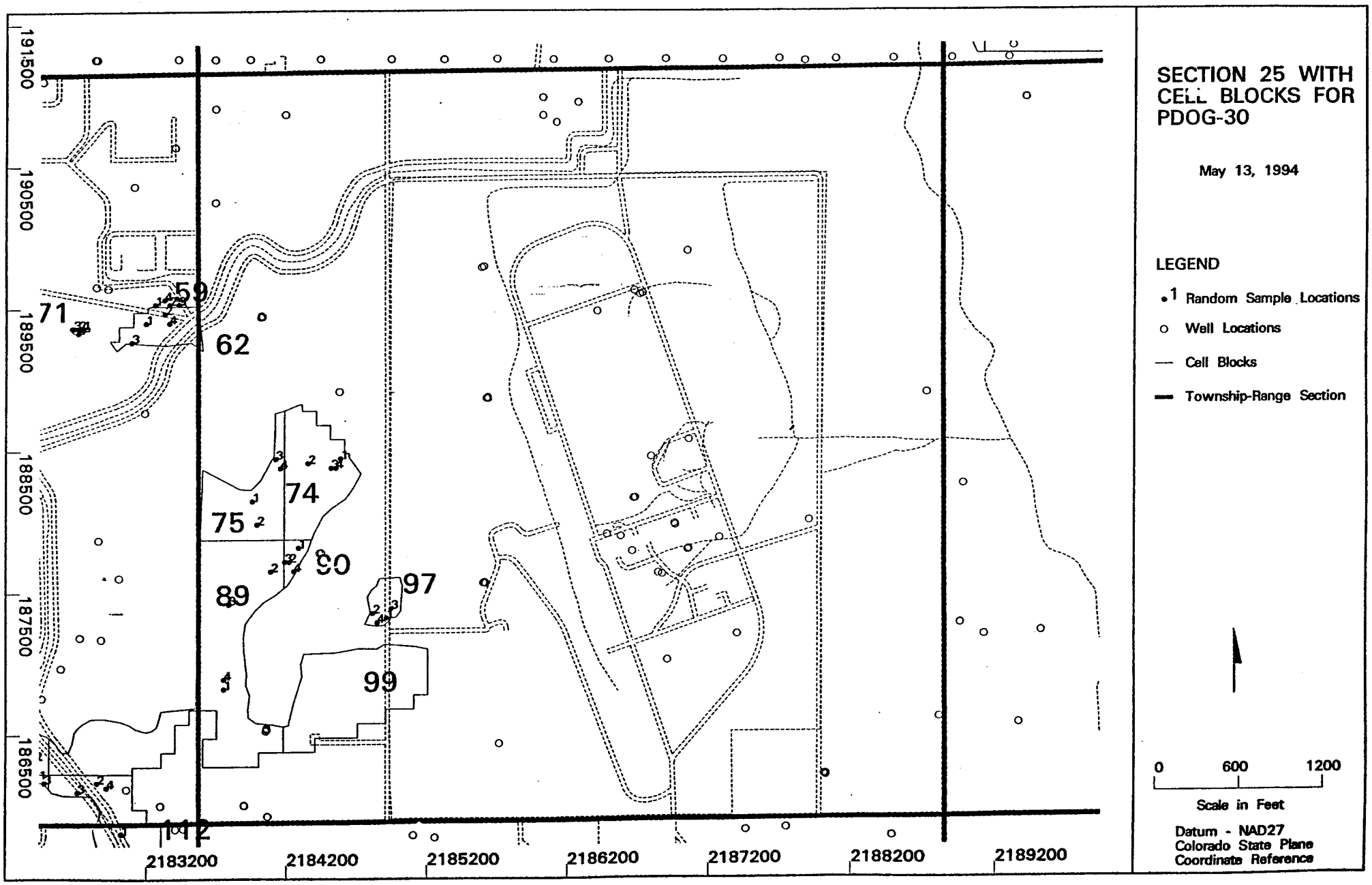

SECTION 12 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane Coordinate Reference
187
189
191
193
194
198
199
201
175700
174700
173700
172700
171700
170700
2183300
2184300
2185300
2186300
2187300
2188300
2189300

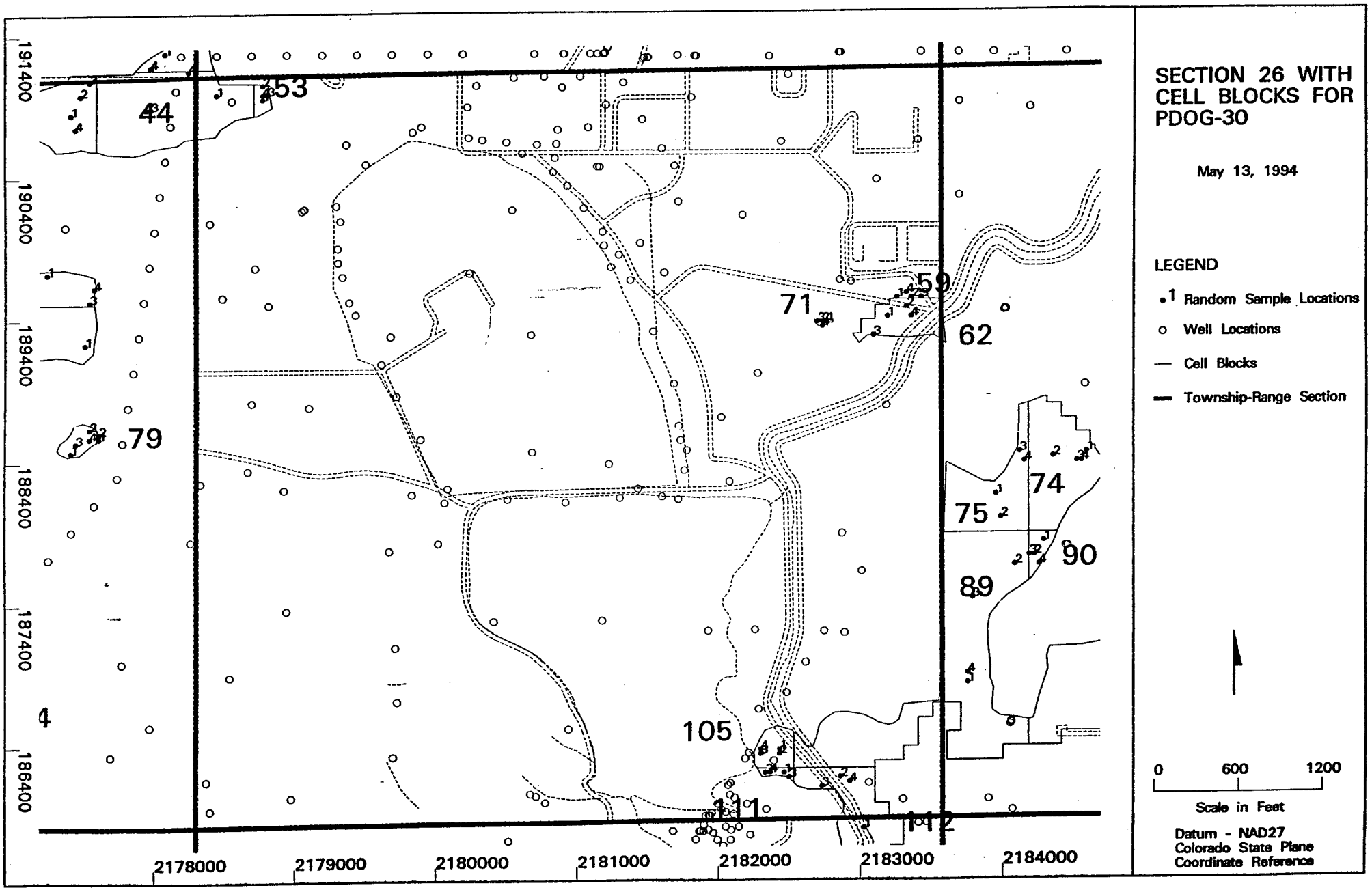

SECTION 19 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
196800
195800
194800
193800
192800
191800
2188400
2189400
2190400
2191400
2192400
2193400
2194400
11
13
15
17
18
19
12
9
10
22
23
24
25
32
33
36
37
39

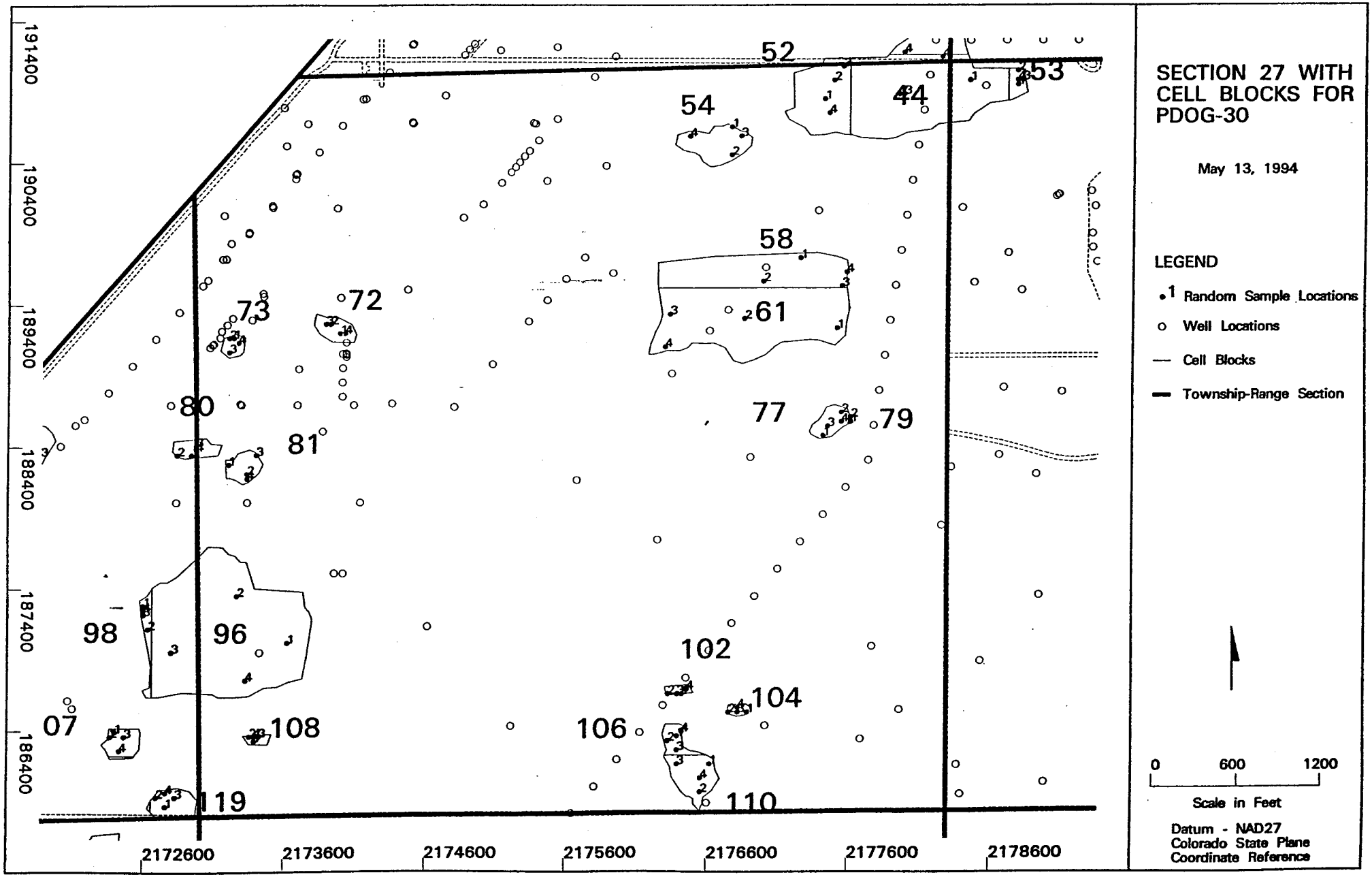

196900
195900
194900
193900
192900
191900
2193600
2194600
2195600
2196600
2197600
2198600
2199600
2
1
6
7
10
20
25
26
27
37
38
SECTION 20 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

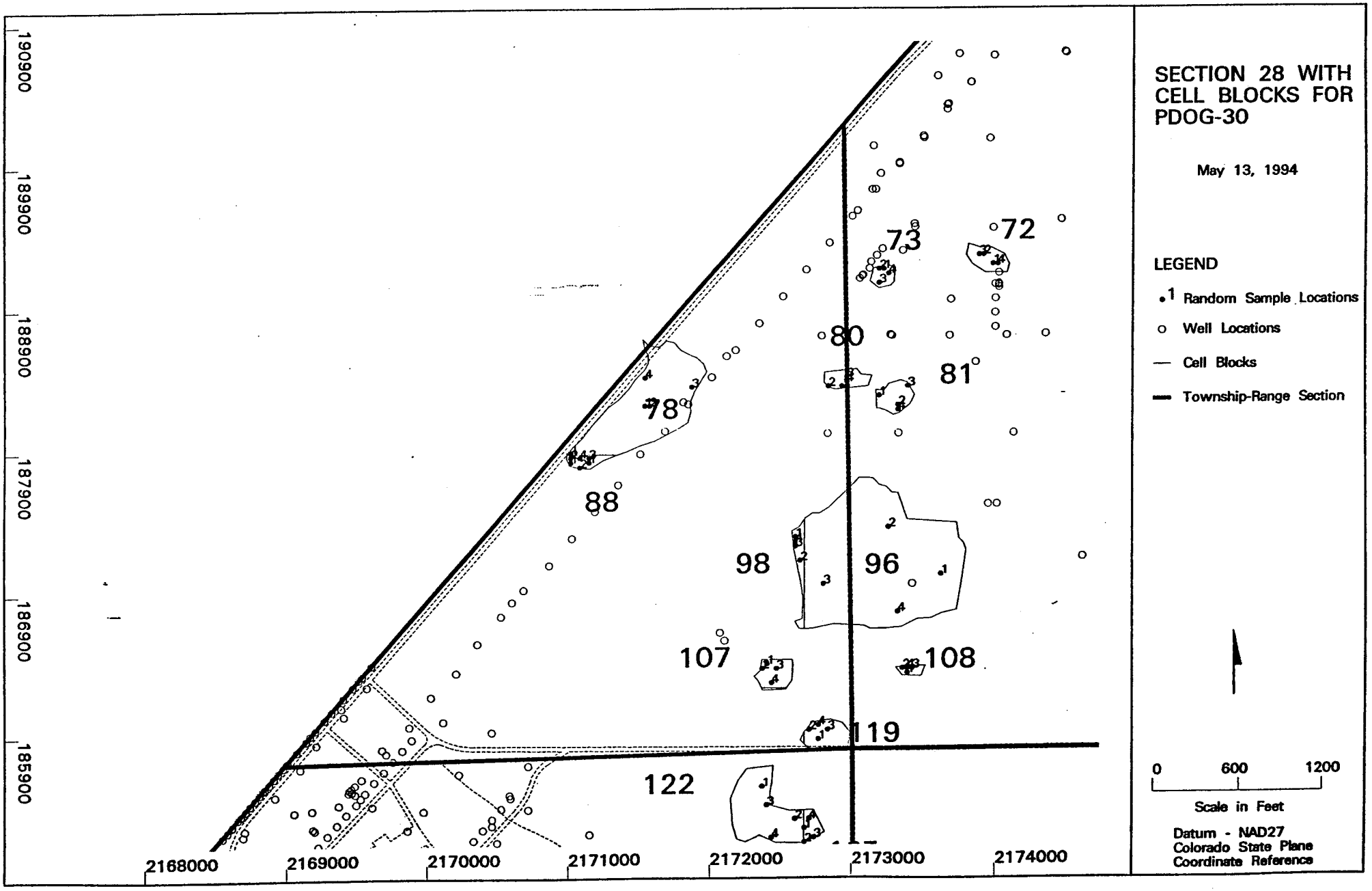

SECTION 22 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
3
5
16
28
29
2
40
52
53
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
196600
195600
194600
193600
192600
191600
2173000
2174000
2175000
2176000
2177000
2178000
2179000

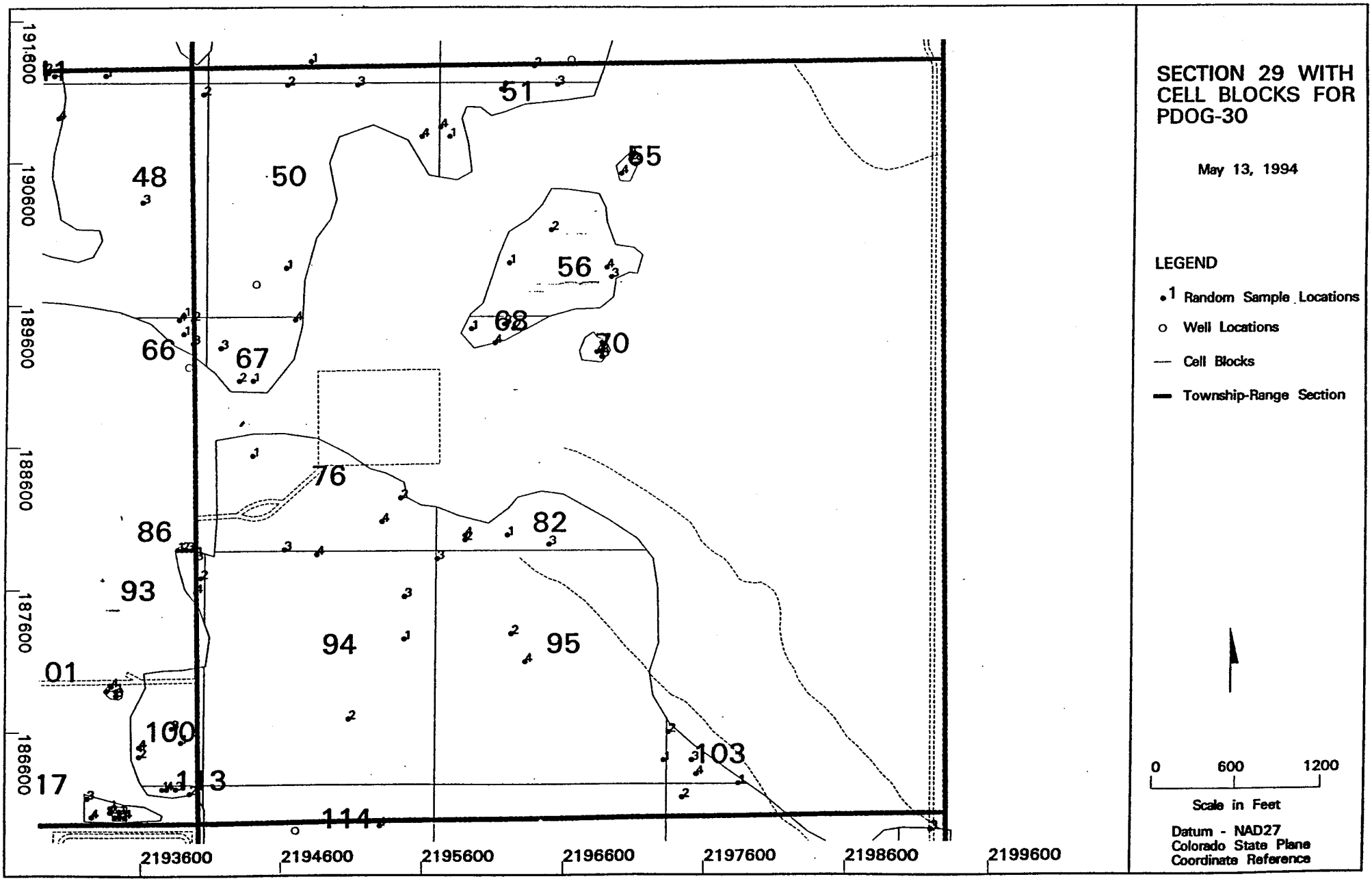

196700
195700
194700
193700
192700
191700
3
5
16
28
21
40
53
2177900
2178900
2179900
2180900
2181900
2182900
2183900
SECTION 23 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


191500
190500
189500
188500
187500
186500
2183200
2184200
2185200
2186200
2187200
2188200
2189200
71
59
62
74
75
90
89
97
99
112
SECTION 25 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 26 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
191400
190400
189400
188400
187400
186400
2178000
2179000
2180000
2181000
2182000
2183000
2184000
44
53
59
71
62
79
74
75
90
89
4
105
111
112


SECTION 27 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
52
53
54
44
58
61
73
72
80
81
77
79
98
96
102
104
07
108
106
119
110
191400
190400
189400
188400
187400
186400
2172600
2173600
2174600
2175600
2176600
2177600
2178600


190900
189900
188900
187900
186900
185900
2168000
2169000
2170000
2171000
2172000
2173000
2174000
73
72
80
81
78
88
98
96
107
108
119
122
SECTION 28 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 29 WITH CELL BLOCKS FOR PDOG-30

May 13, 1994

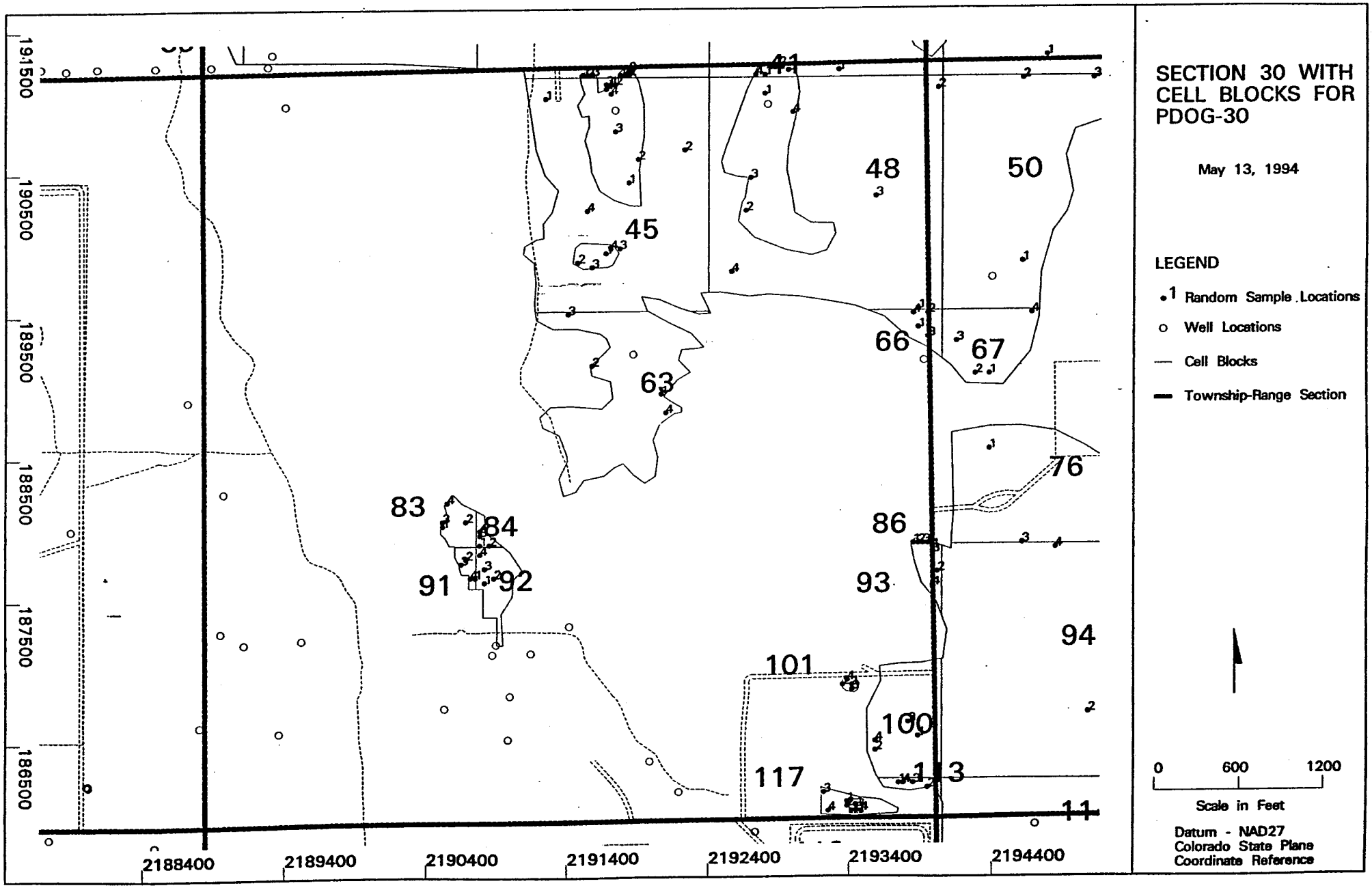
LEGEND

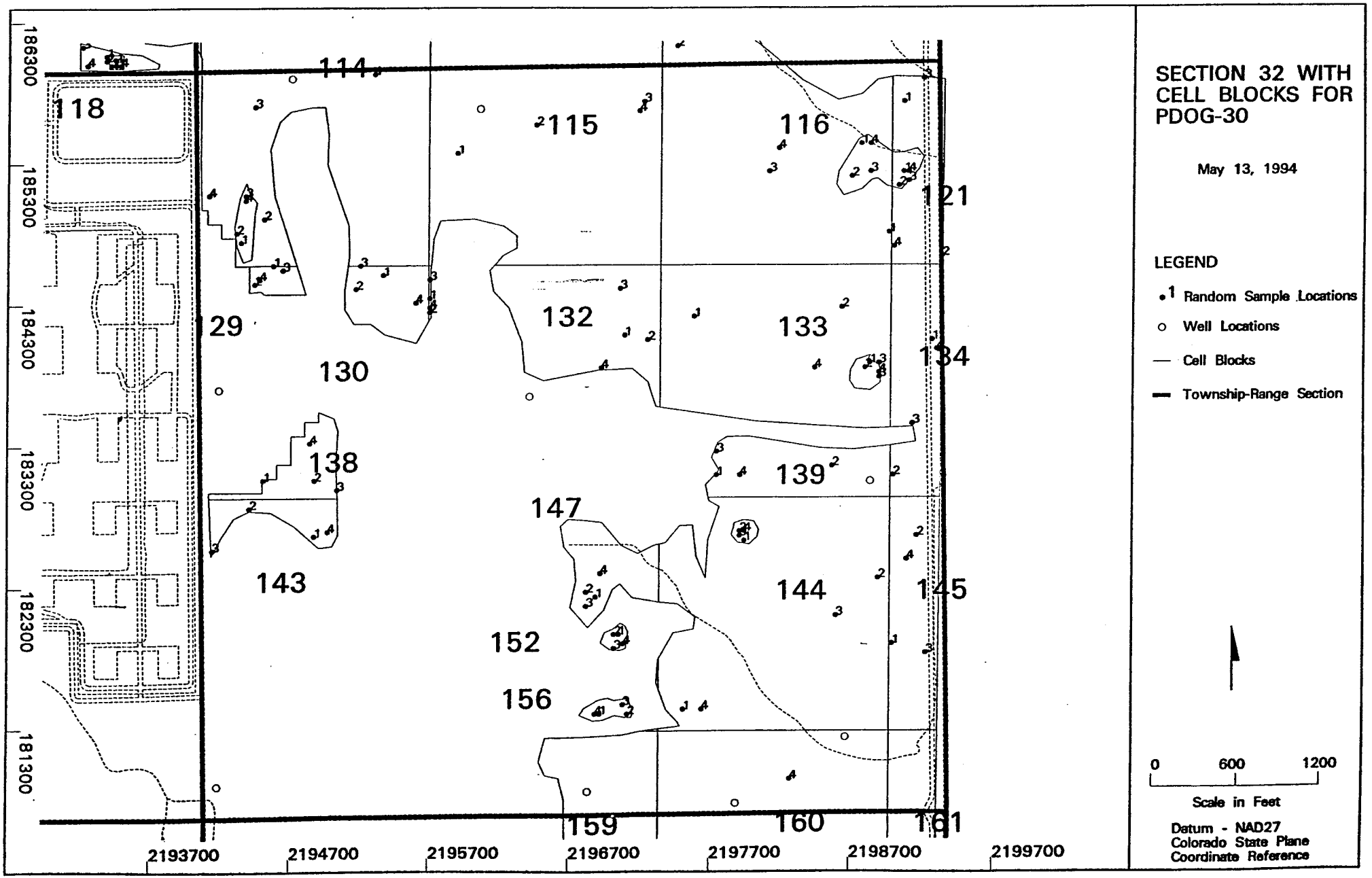
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

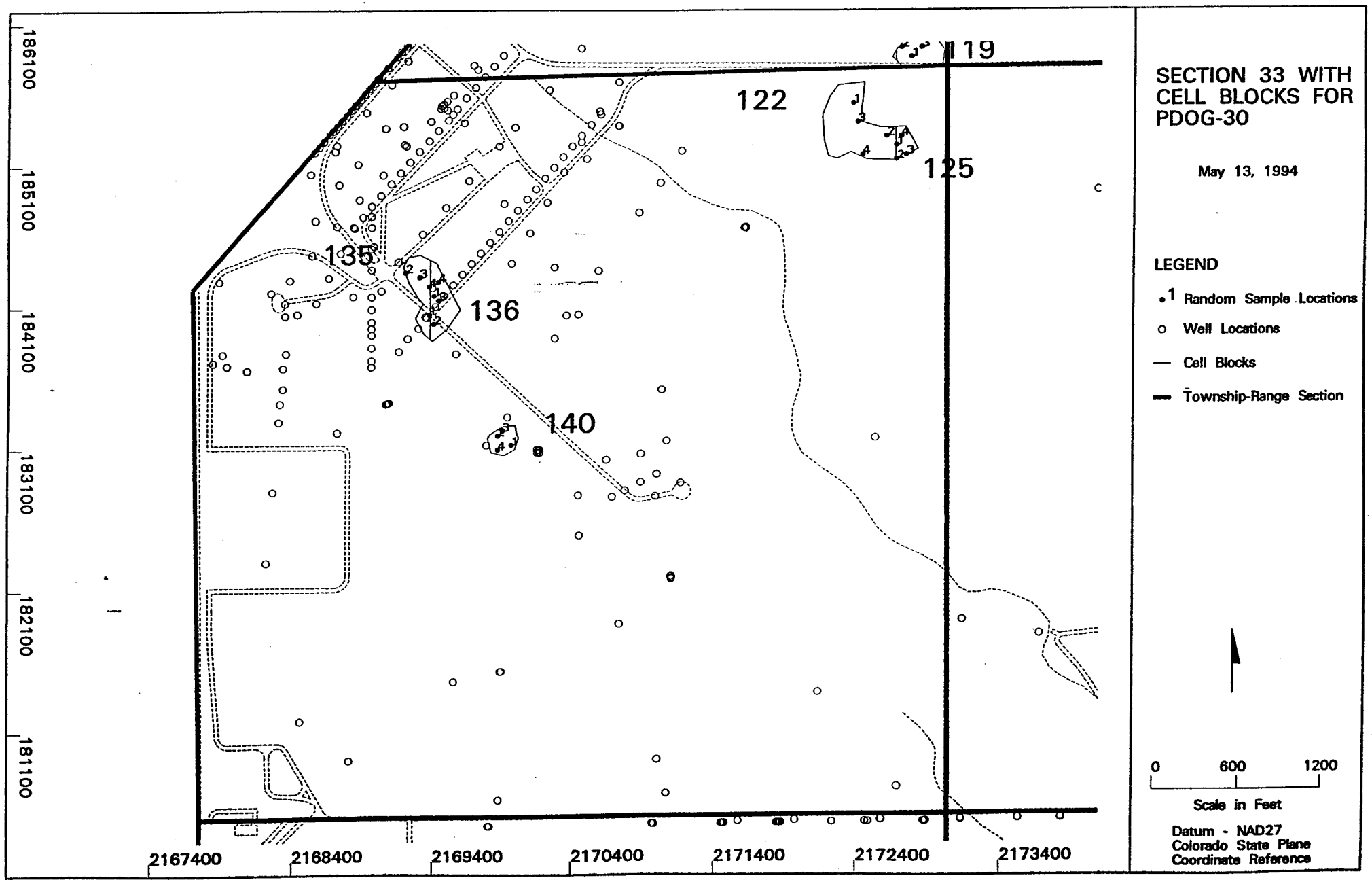
0 600 1200

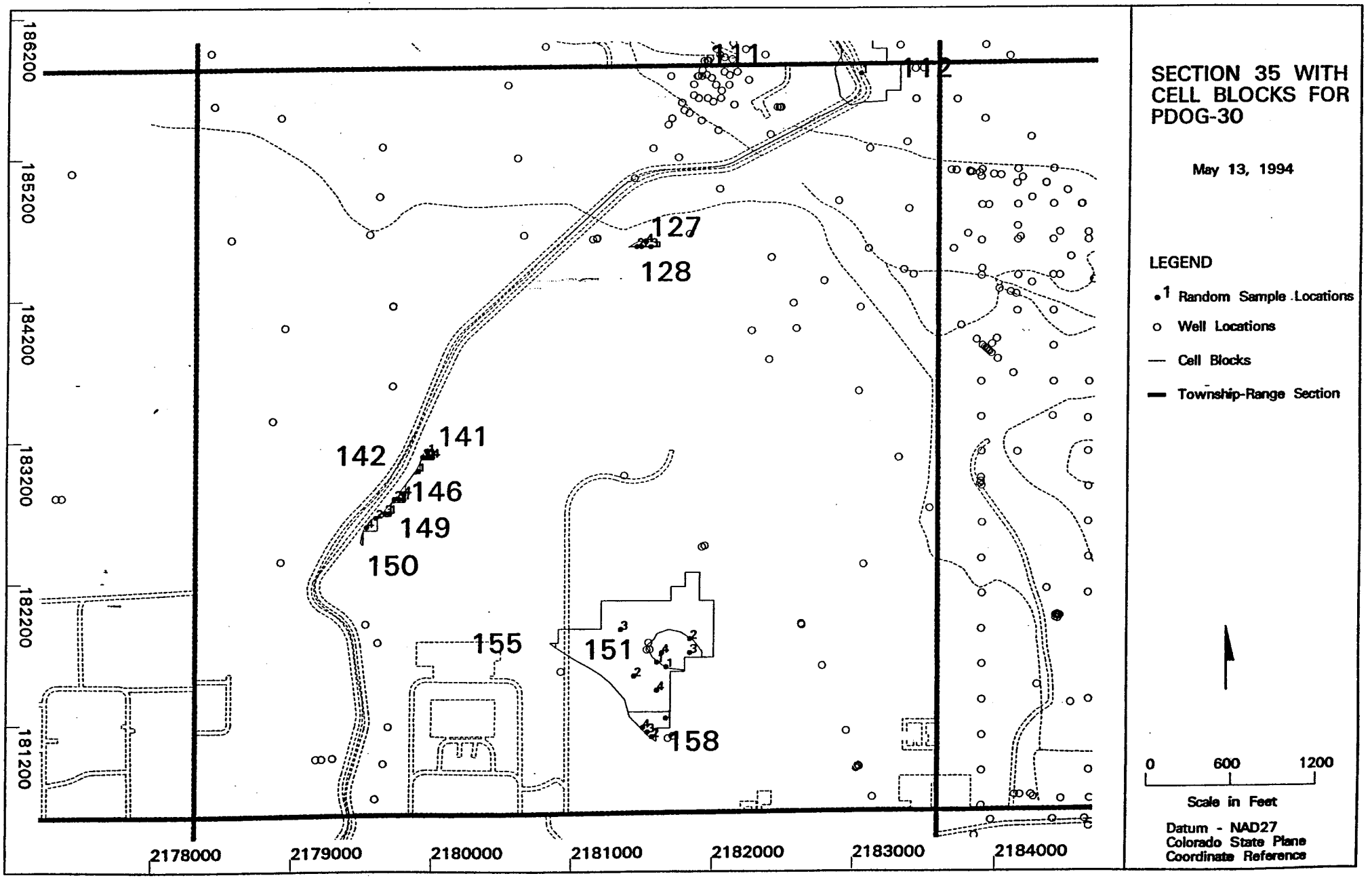
Scale in Feet

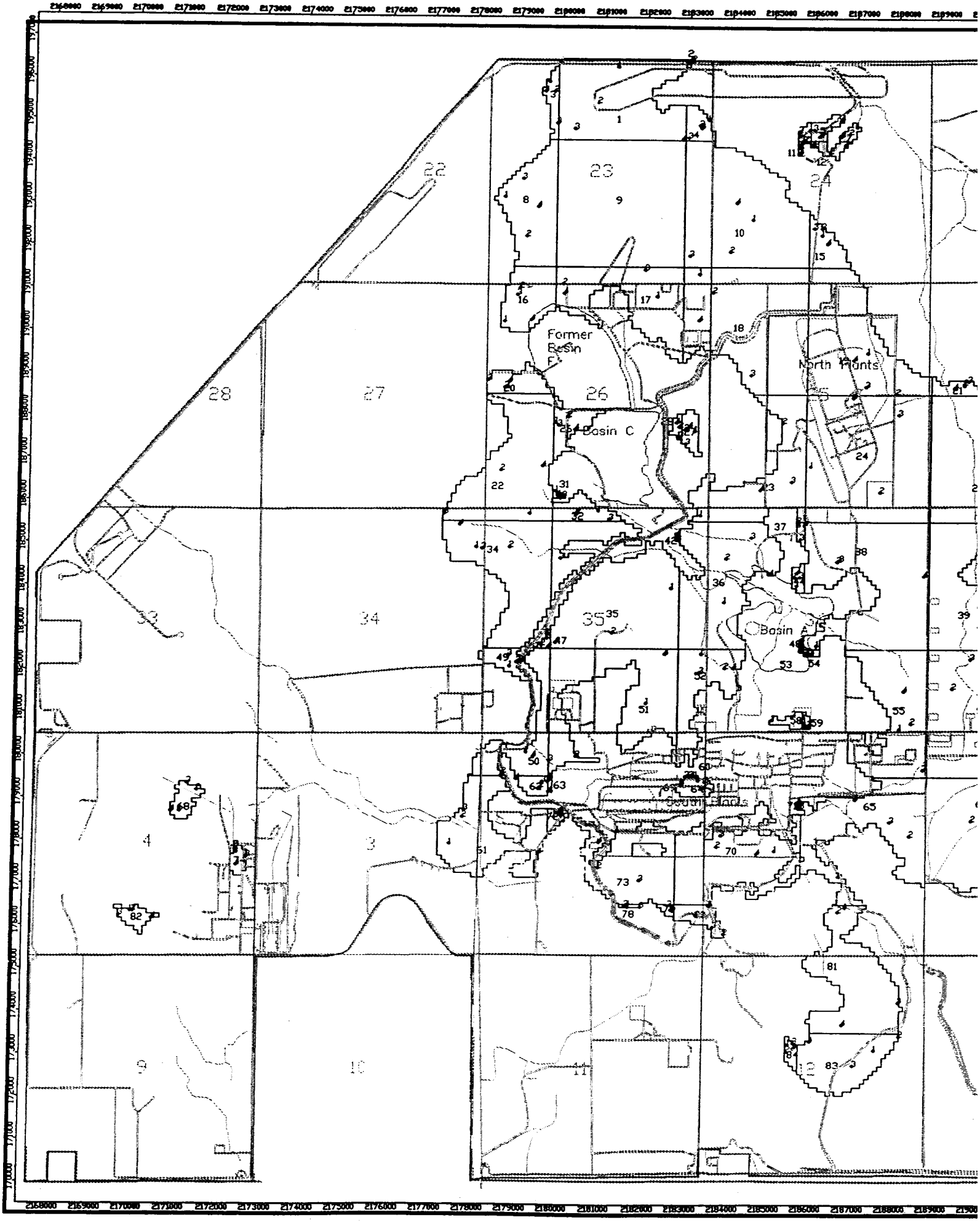
Datum - NAD27
Colorado State Plane
Coordinate Reference

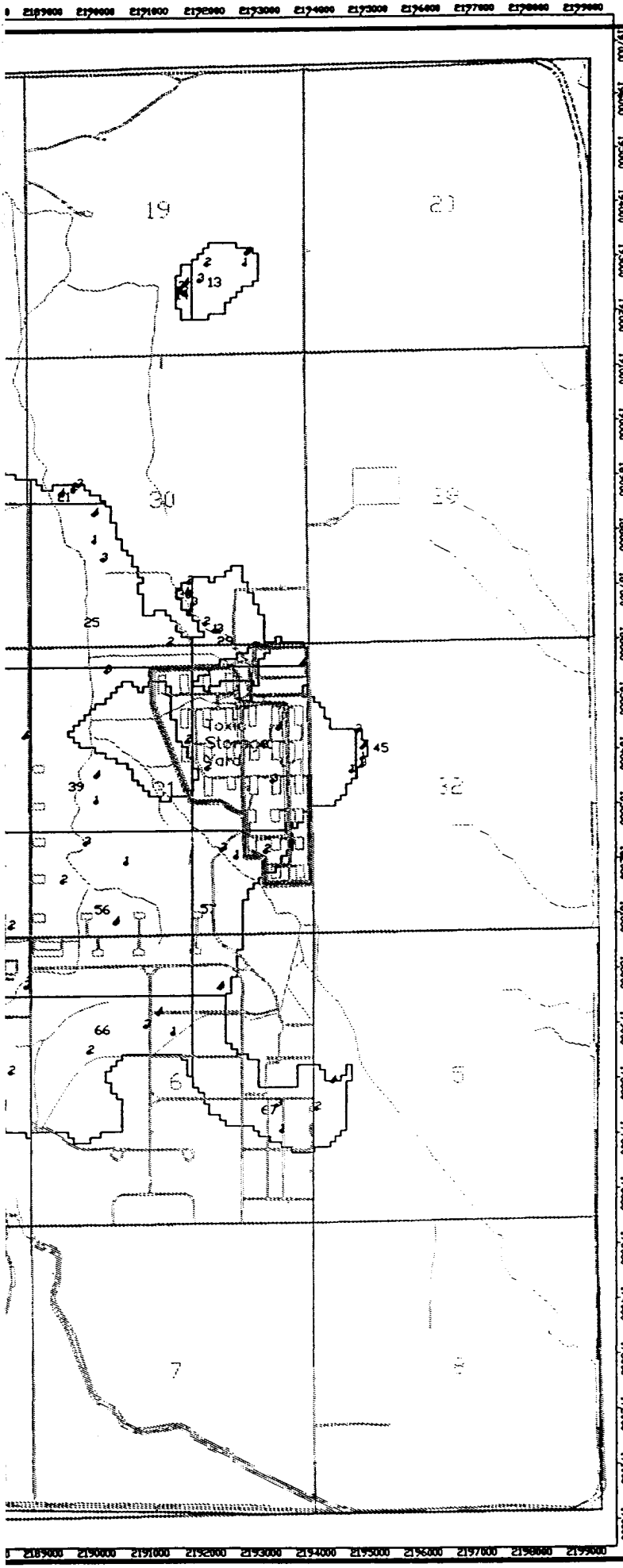

SECTION 30 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
191500
190500
189500
188500
187500
186500
2188400
2189400
2190400
2191400
2192400
2193400
2194400
45
48
50
63
66
67
76
83
84
86
91
92
93
94
101
100
117
113
11


SECTION 32 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
114
115
116
118
121
29
130
132
133
134
138
139
147
143
144
145
152
156
159
160
161
186300
185300
184300
183300
182300
181300
2193700
2194700
2195700
2196700
2197700
2198700
2199700


SECTION 33 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
119
122
125
135
136
140
186100
185100
184100
183100
182100
181100
2167400
2168400
2169400
2170400
2171400
2172400
2173400
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 35 WITH CELL BLOCKS FOR PDOG-30
May 13, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
111
112
127
128
141
142
146
149
150
155
151
158
186200
185200
184200
183200
182200
181200
2178000
2179000
2180000
2181000
2182000
2183000
2184000
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


Former Basin F
North Plants
Basin C
Basin A
South Plants



Legend

Sampling Block

Lake

31 Section Number

Section Line

N

0 2000 4000

Scale in Feet

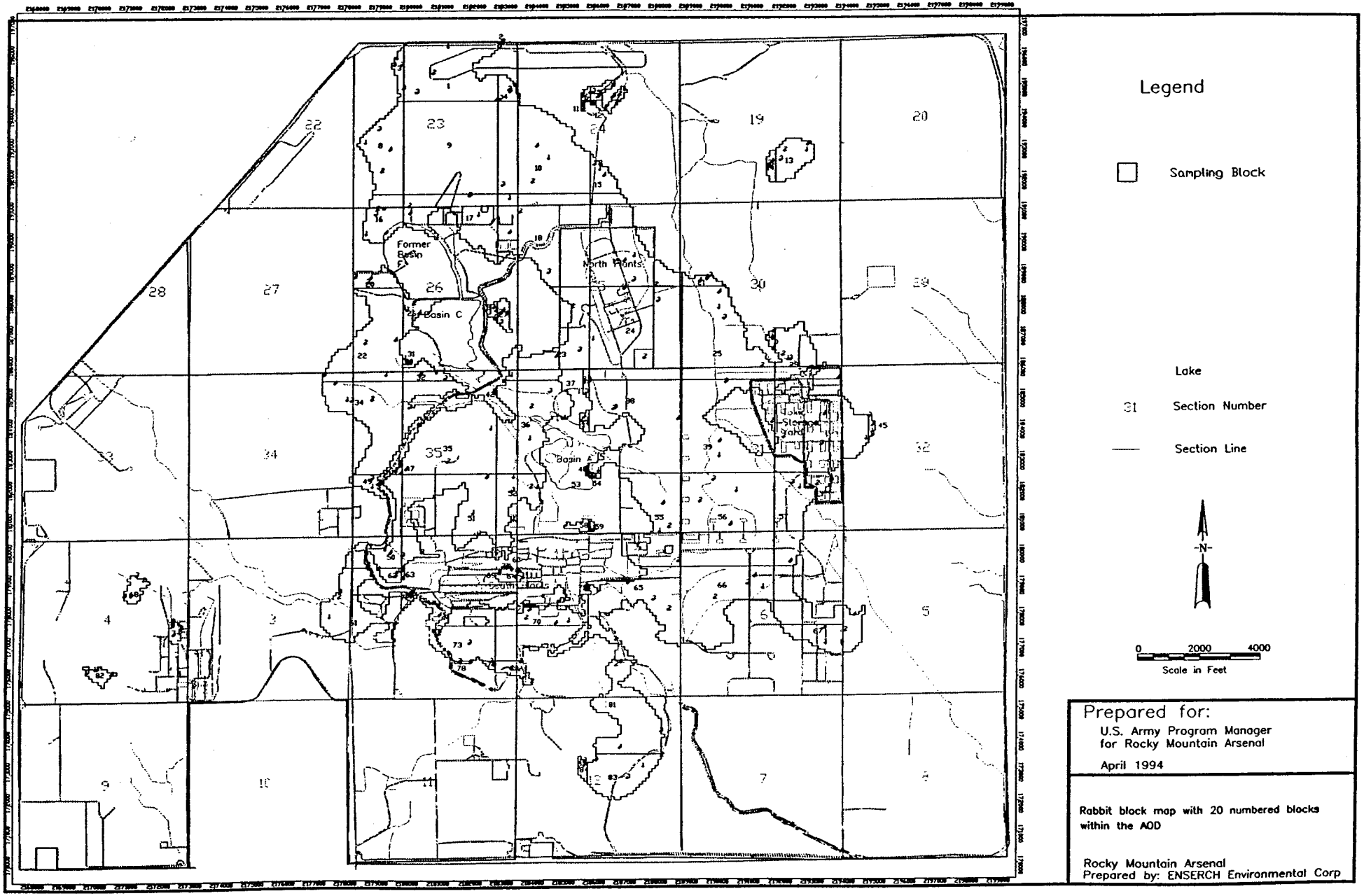
Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

April 1994

Rabbit block map with 20 numbered blocks within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp

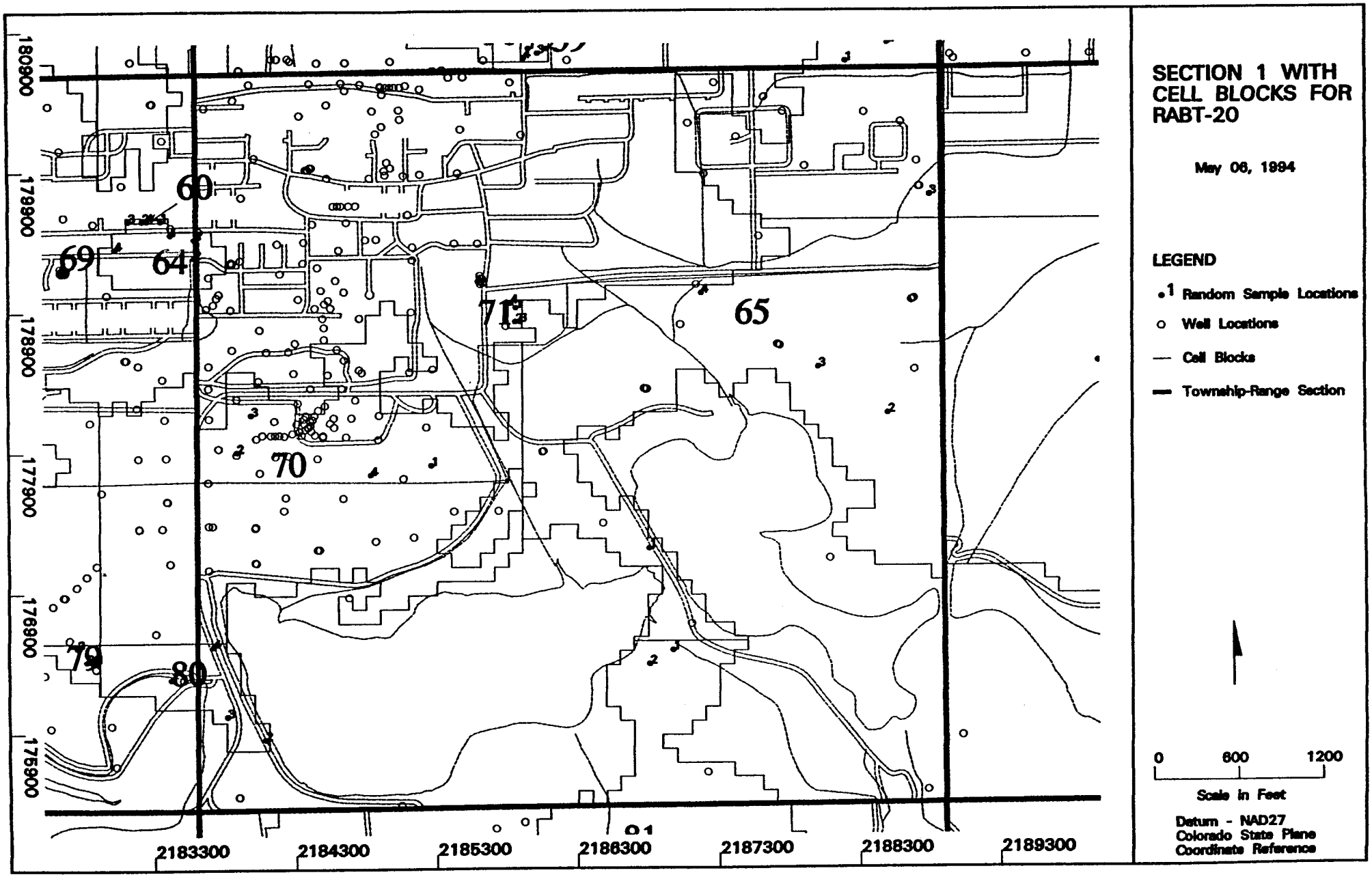


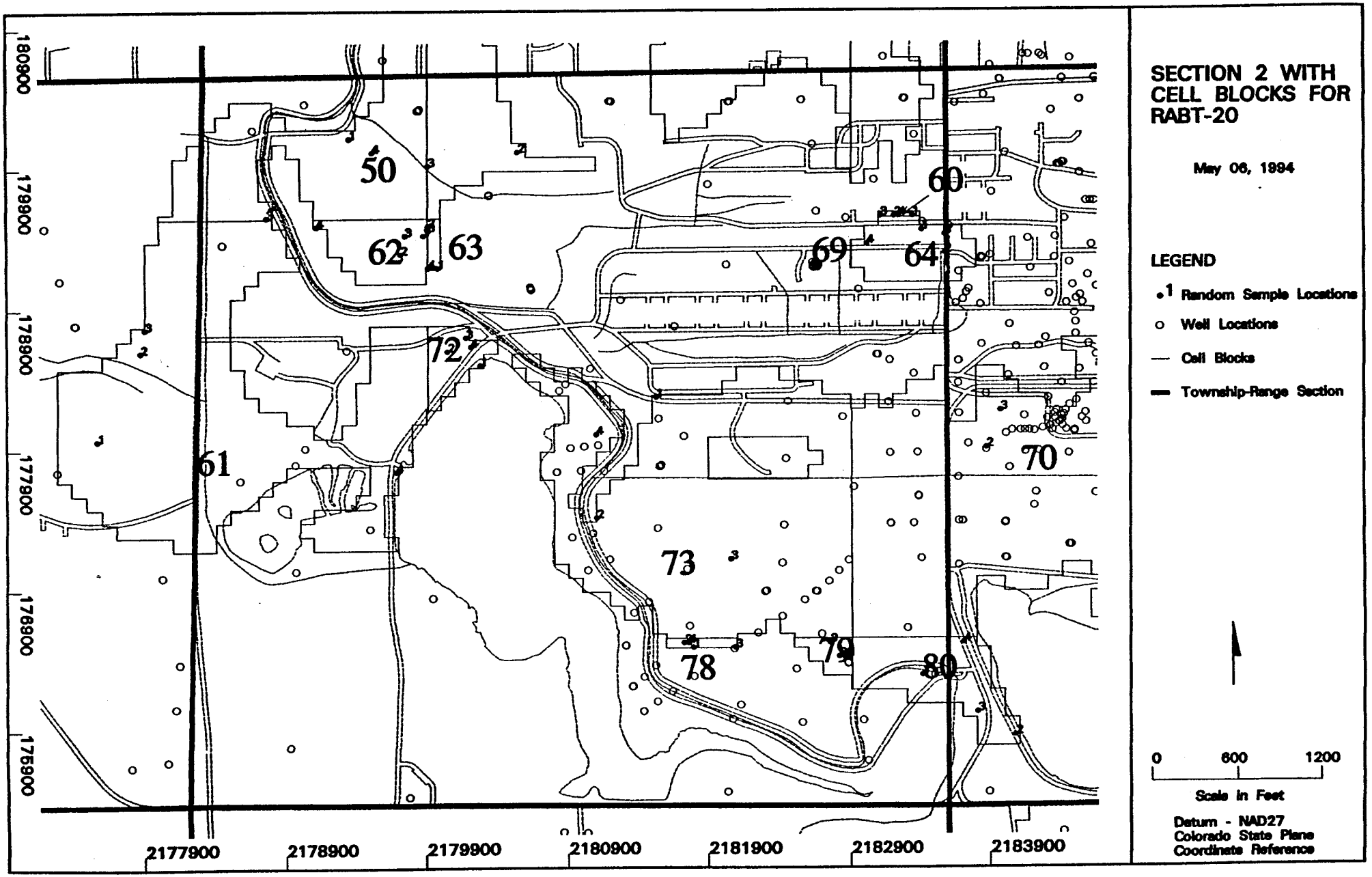
Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

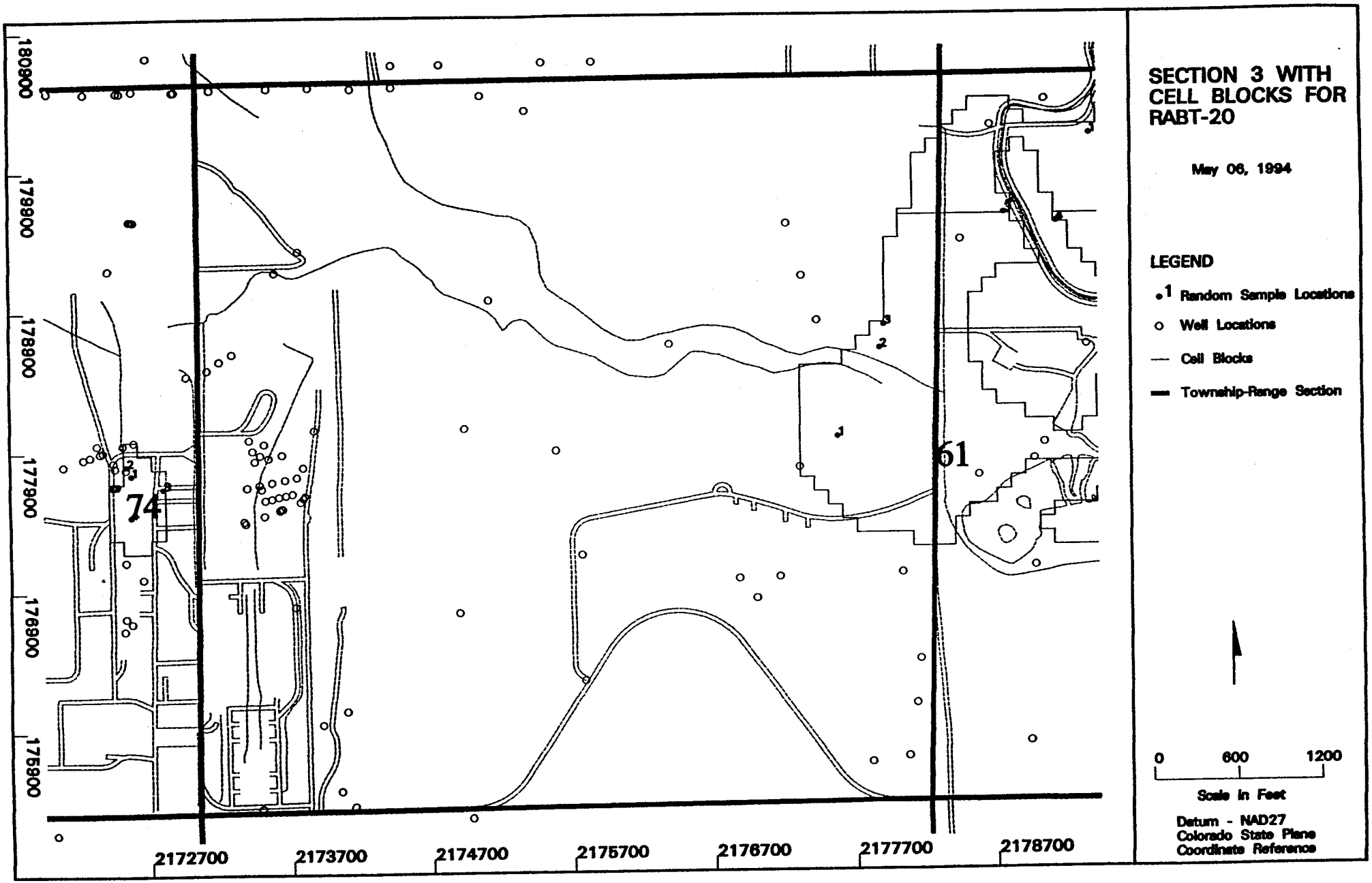
April 1994

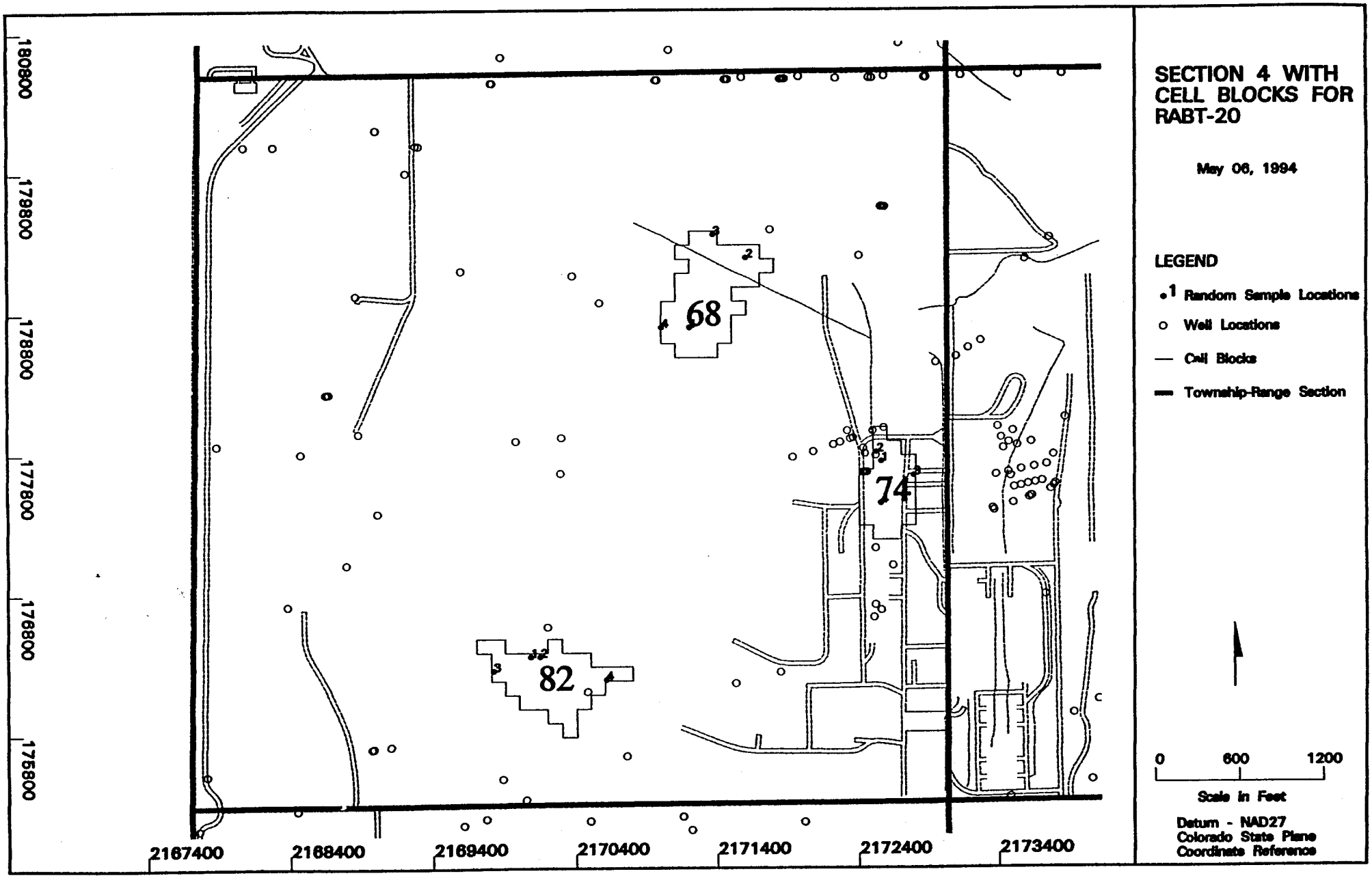
Rabbit block map with 20 numbered blocks within the AOD

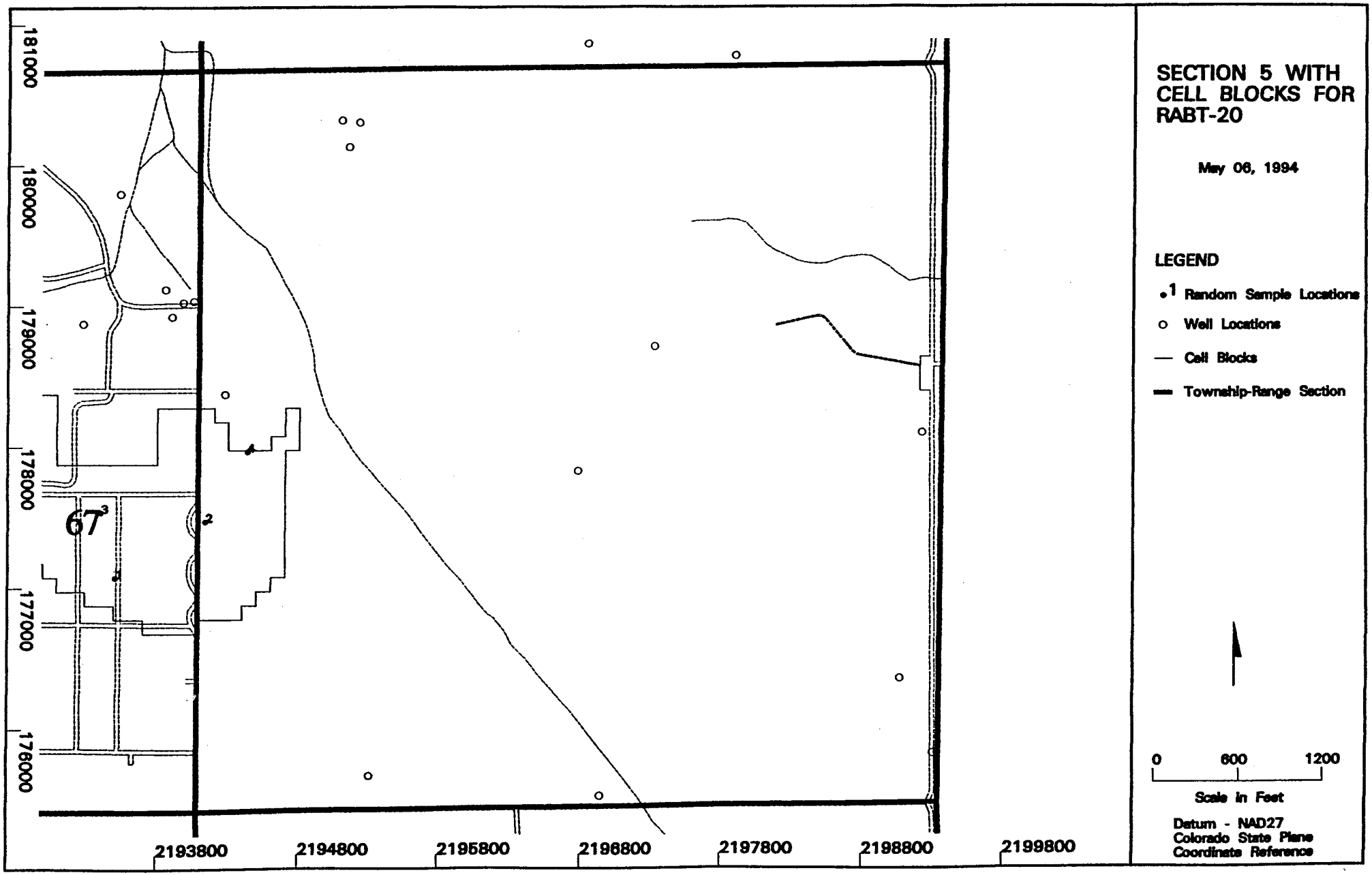
Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp

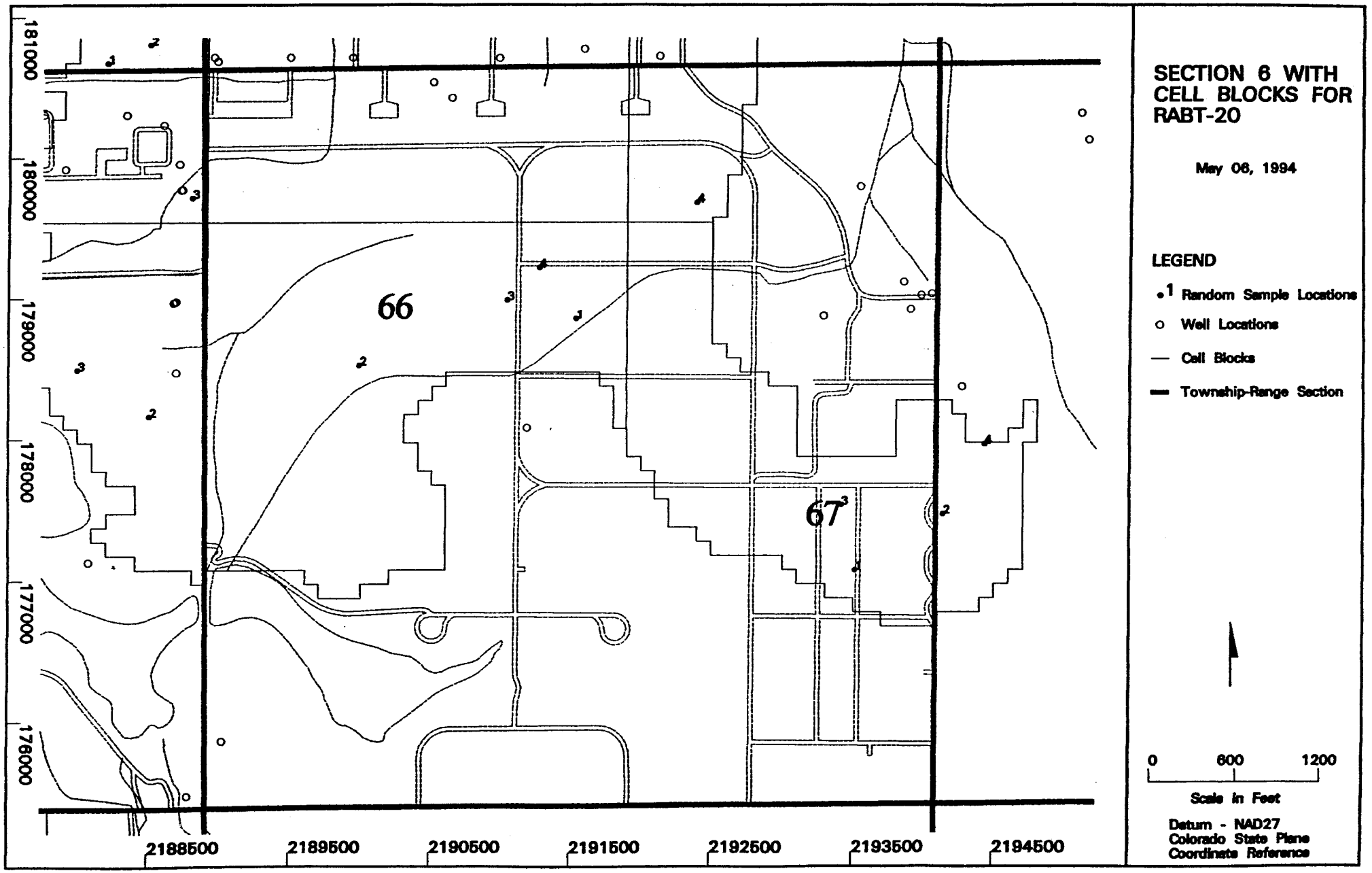

SECTION 1 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
180800
179800
178800
177800
176800
175900
2183300
2184300
2185300
2186300
2187300
2188300
2189300
60
69
64
71
65
70
79
80

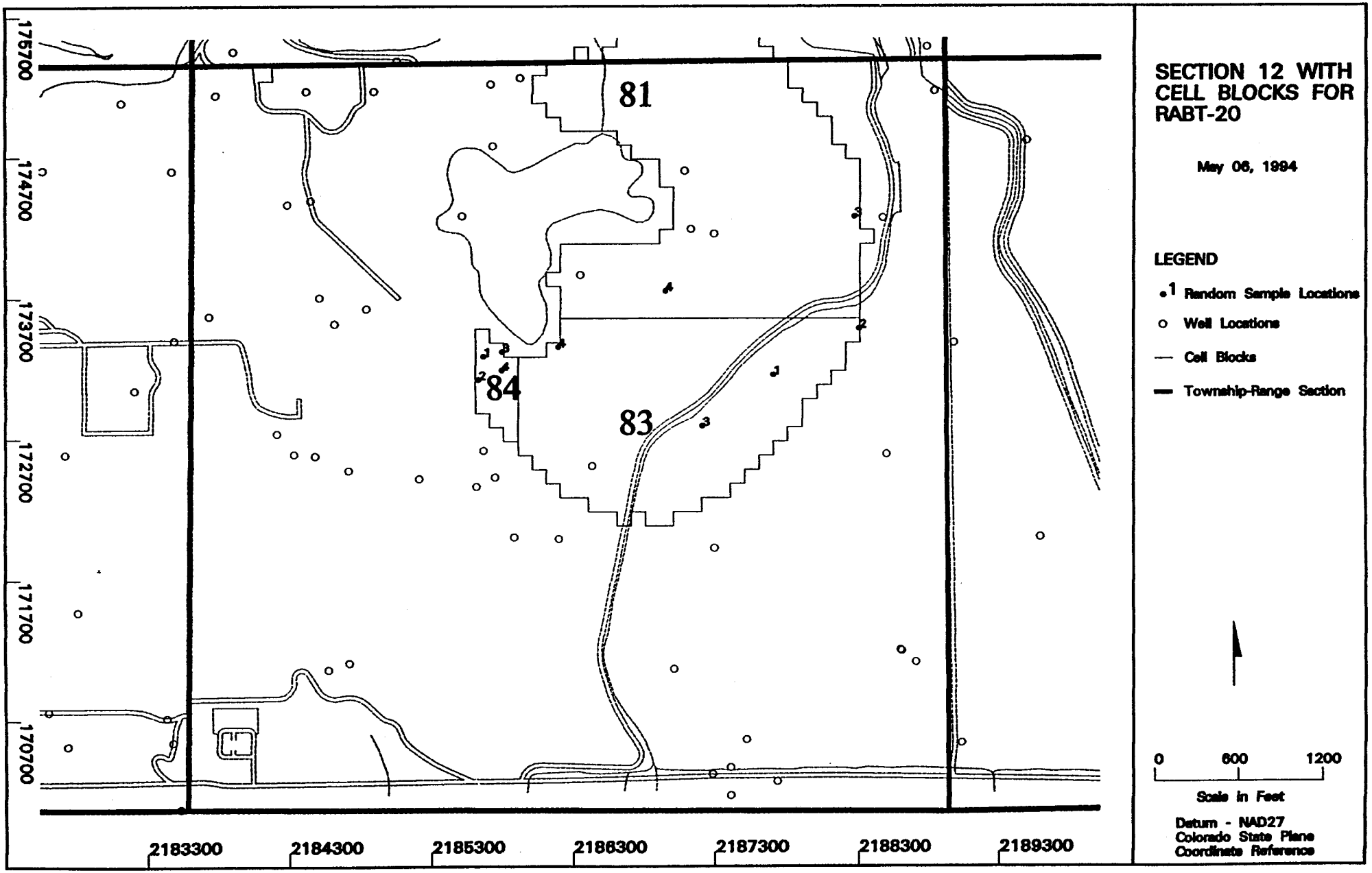

SECTION 2 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
50
60
62
63
69
64
72
61
70
73
78
79
80
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
1180900
1179900
1178900
1177900
1176900
1175900
2177900
2178900
2179900
2180900
2181900
2182900
2183900

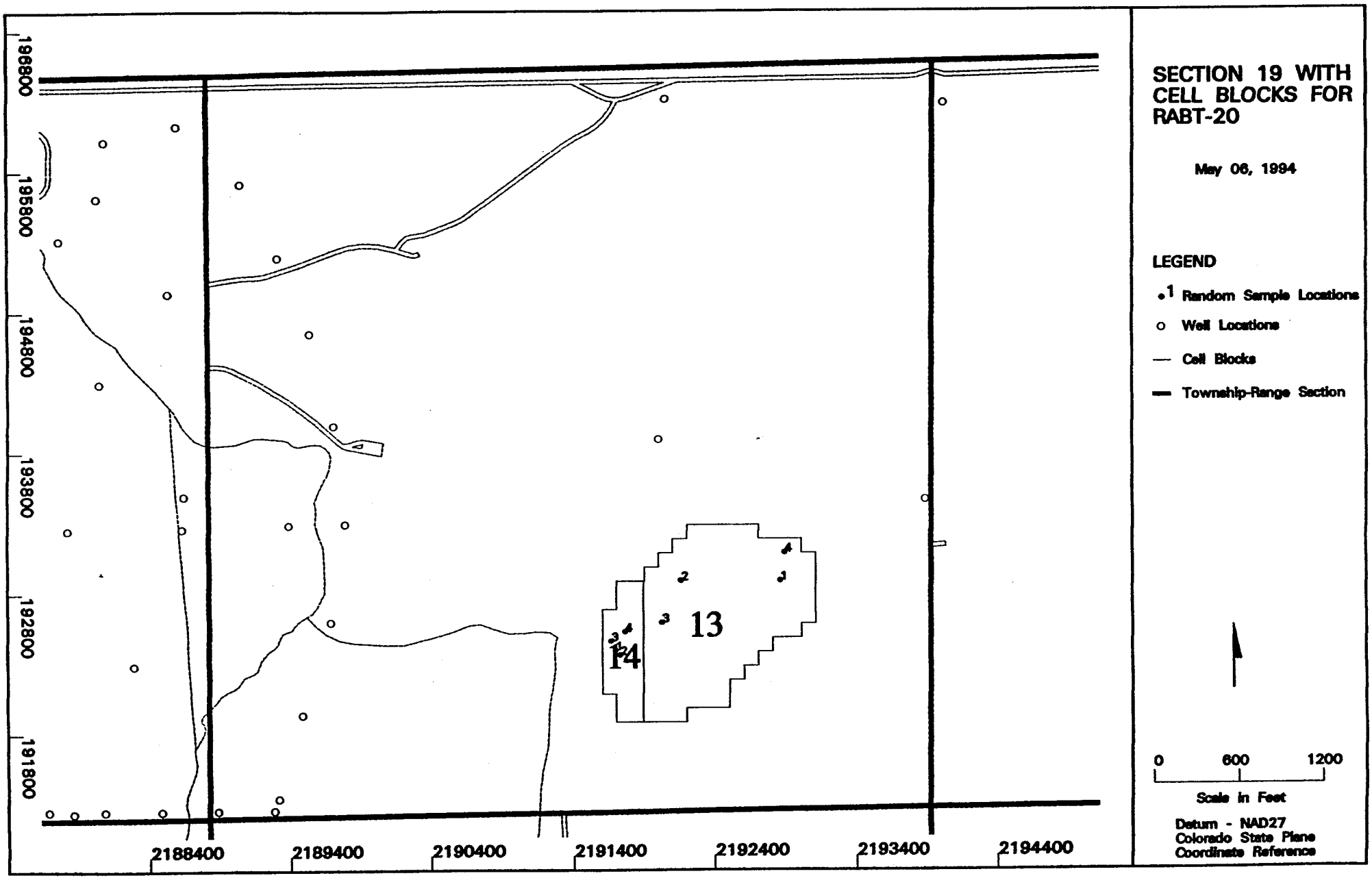

180900
179900
178900
177900
176900
175900
2172700
2173700
2174700
2175700
2176700
2177700
2178700
74
61
SECTION 3 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale In Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

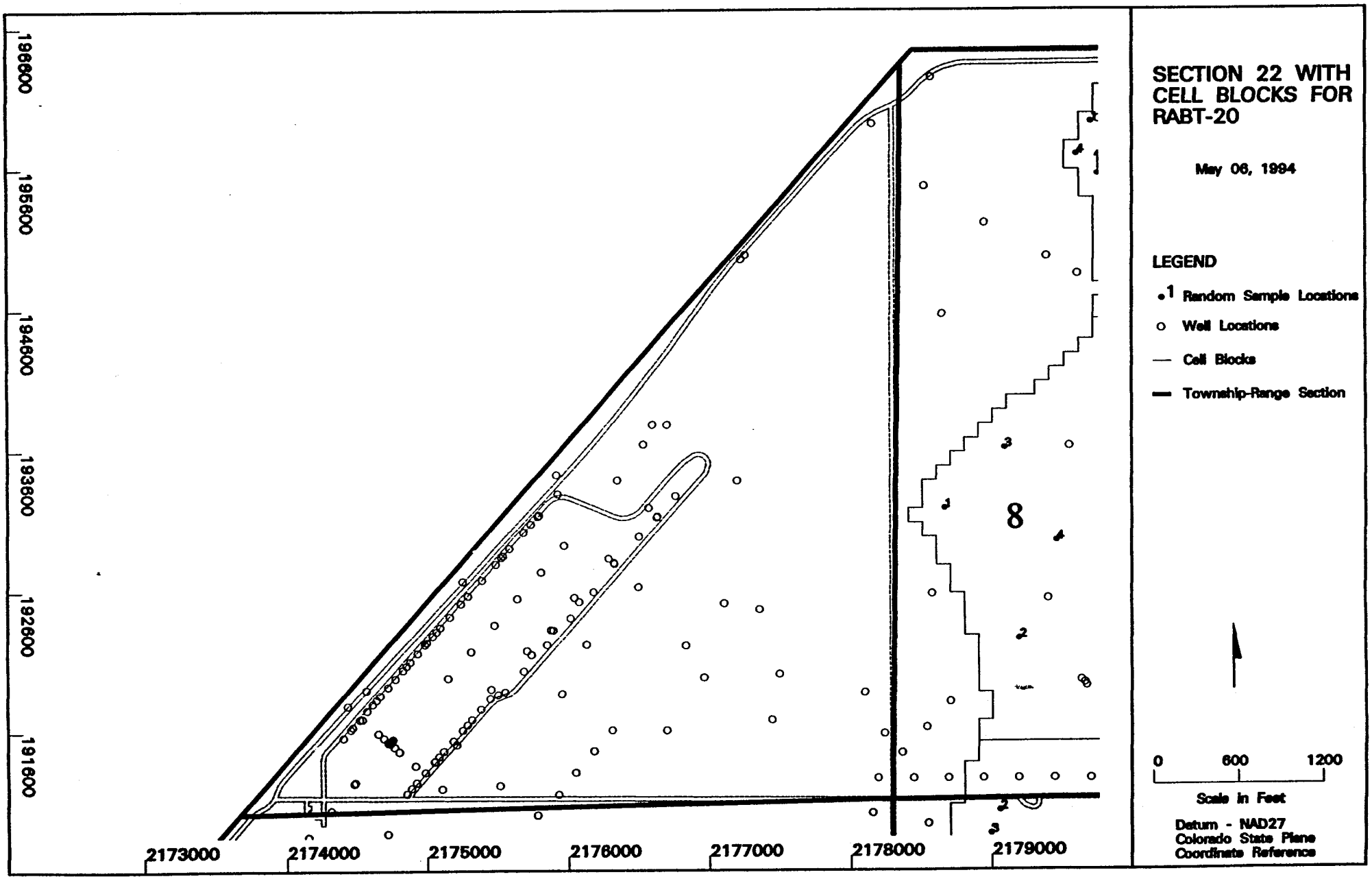

180800
179800
178800
177800
176800
175800
2167400
2168400
2169400
2170400
2171400
2172400
2173400
68
74
82
SECTION 4 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

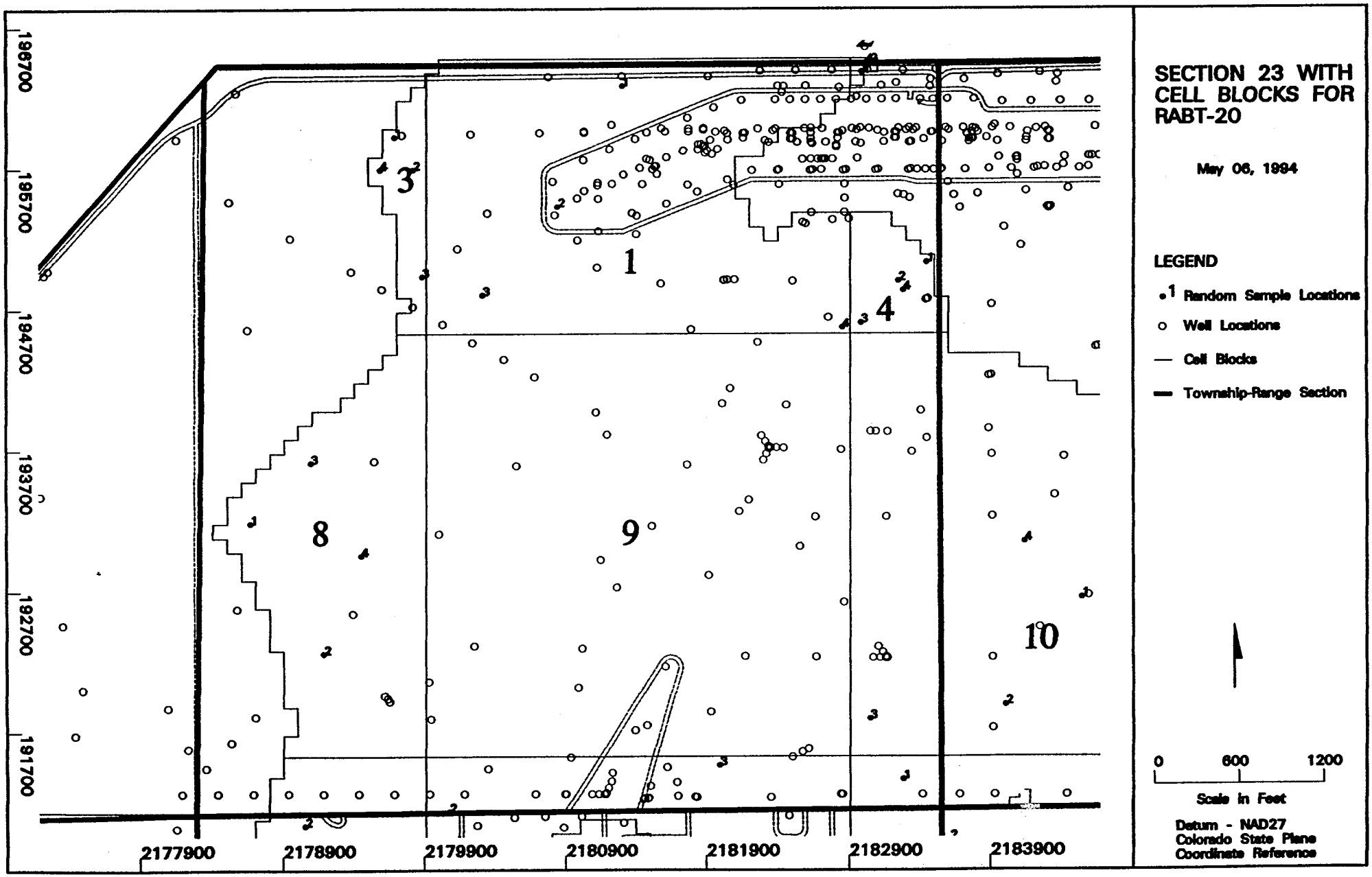

181000
180000
179000
178000
177000
176000
2193800
2194800
2195800
2196800
2197800
2198800
2199800
67
3
2
1
SECTION 5 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

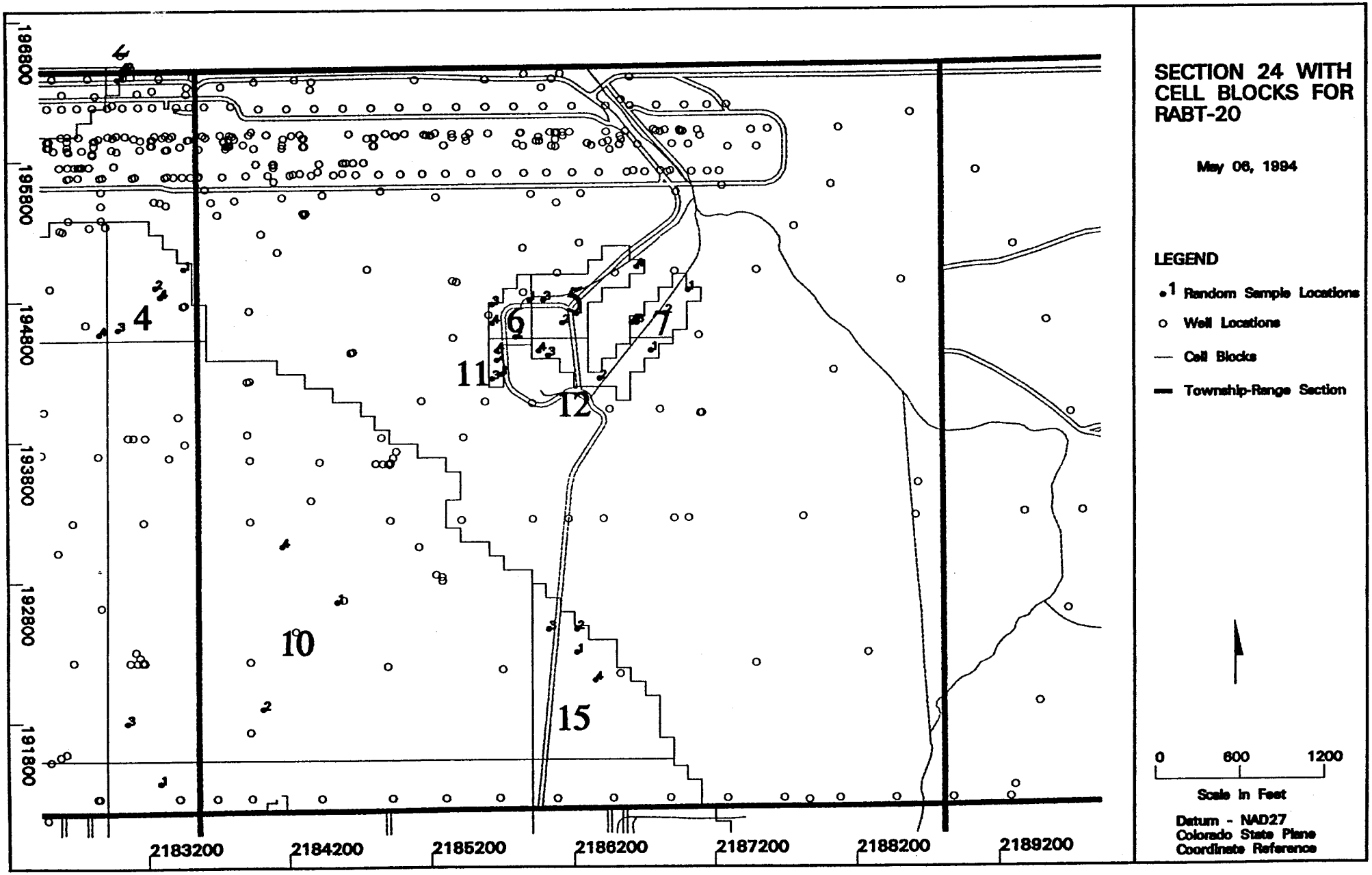

181000
180000
179000
178000
177000
176000
66
67
2188500
2189500
2190500
2191500
2192500
2193500
2194500
SECTION 6 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

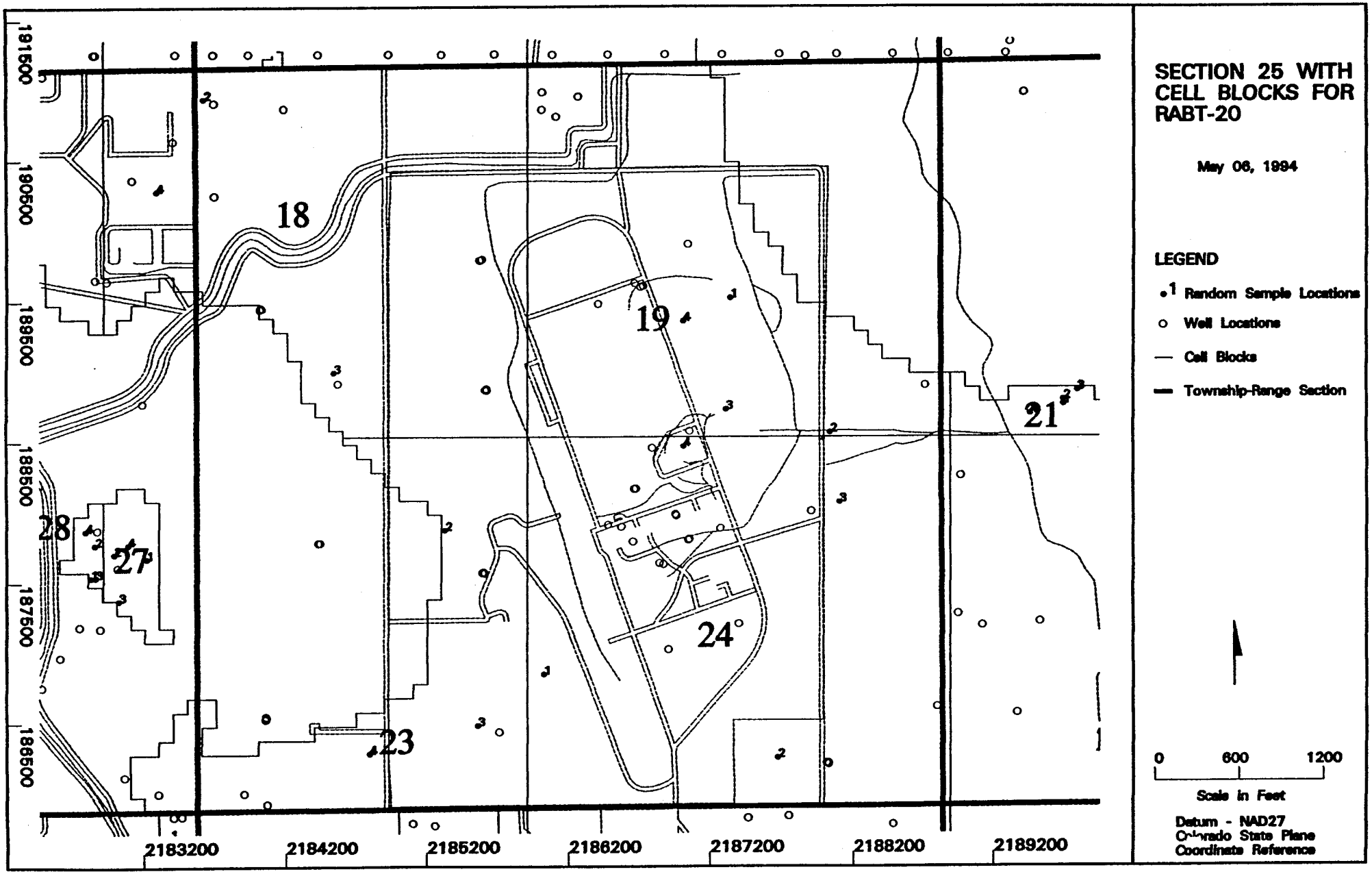

SECTION 12 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
81
84
83
175700
174700
173700
172700
171700
170700
2183300
2184300
2185300
2186300
2187300
2188300
2189300
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

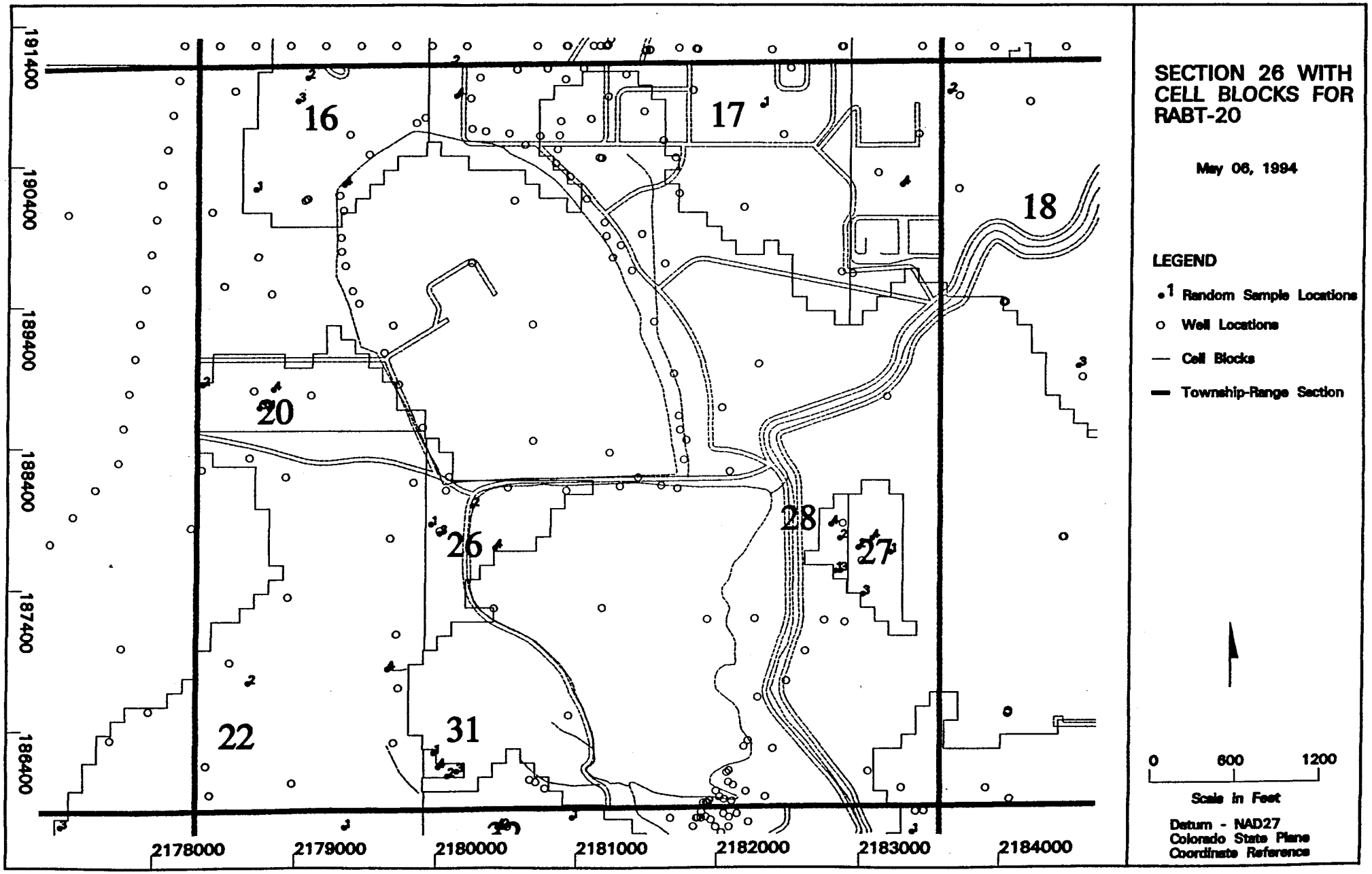

196800
195800
194800
193800
192800
191800
2188400
2189400
2190400
2191400
2192400
2193400
2194400
13
14
SECTION 19 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

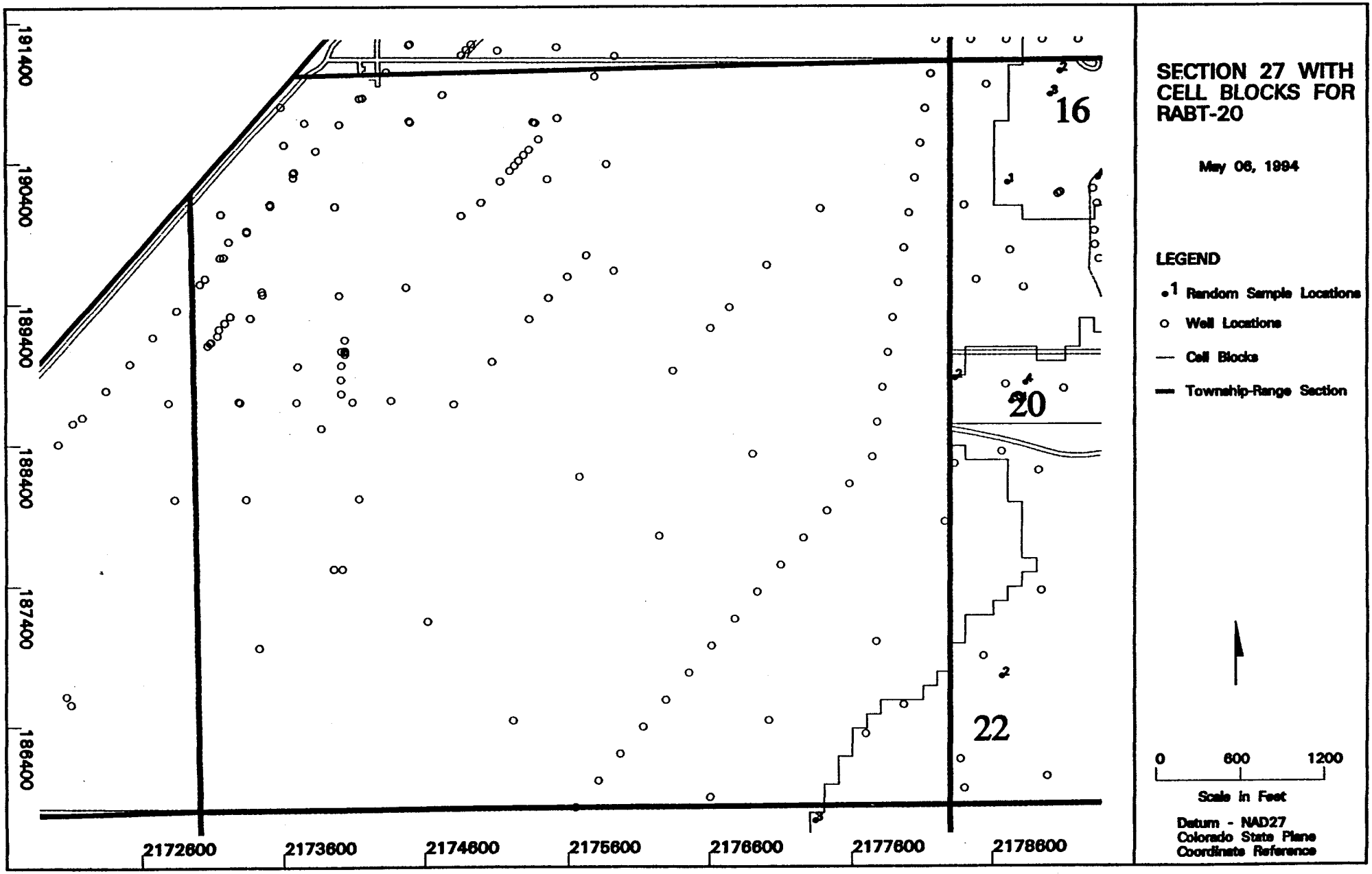

196600
195600
194600
193600
192600
191600
2173000
2174000
2175000
2176000
2177000
2178000
2179000
8
SECTION 22 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

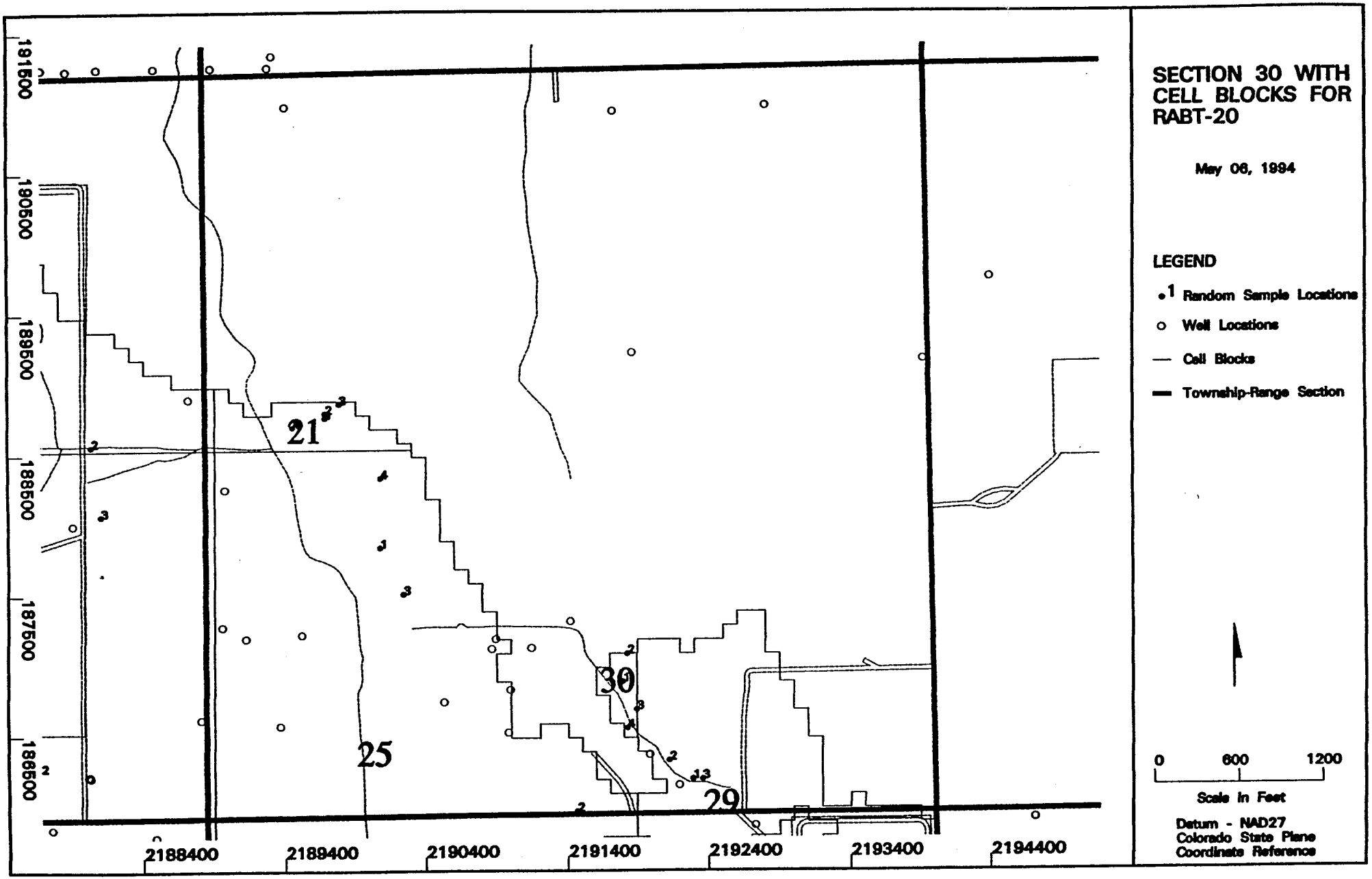

196700
195700
194700
193700
192700
191700
2177900
2178900
2179900
2180900
2181900
2182900
2183900
1
3
4
8
9
10
SECTION 23 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

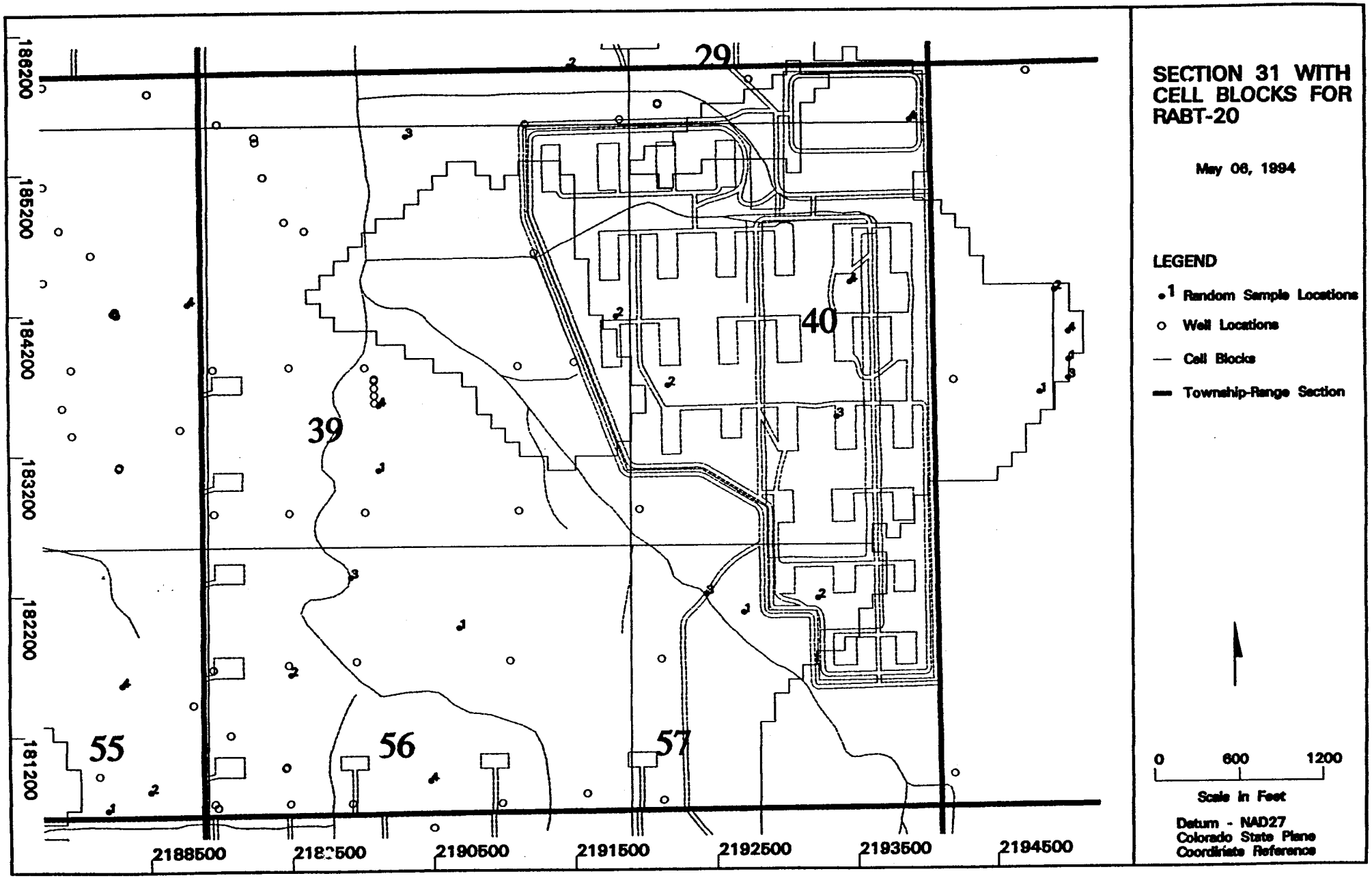

SECTION 24 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale In Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
196800
195800
194800
193800
192800
191800
2183200
2184200
2185200
2186200
2187200
2188200
2189200
4
5
6
7
10
11
12
15

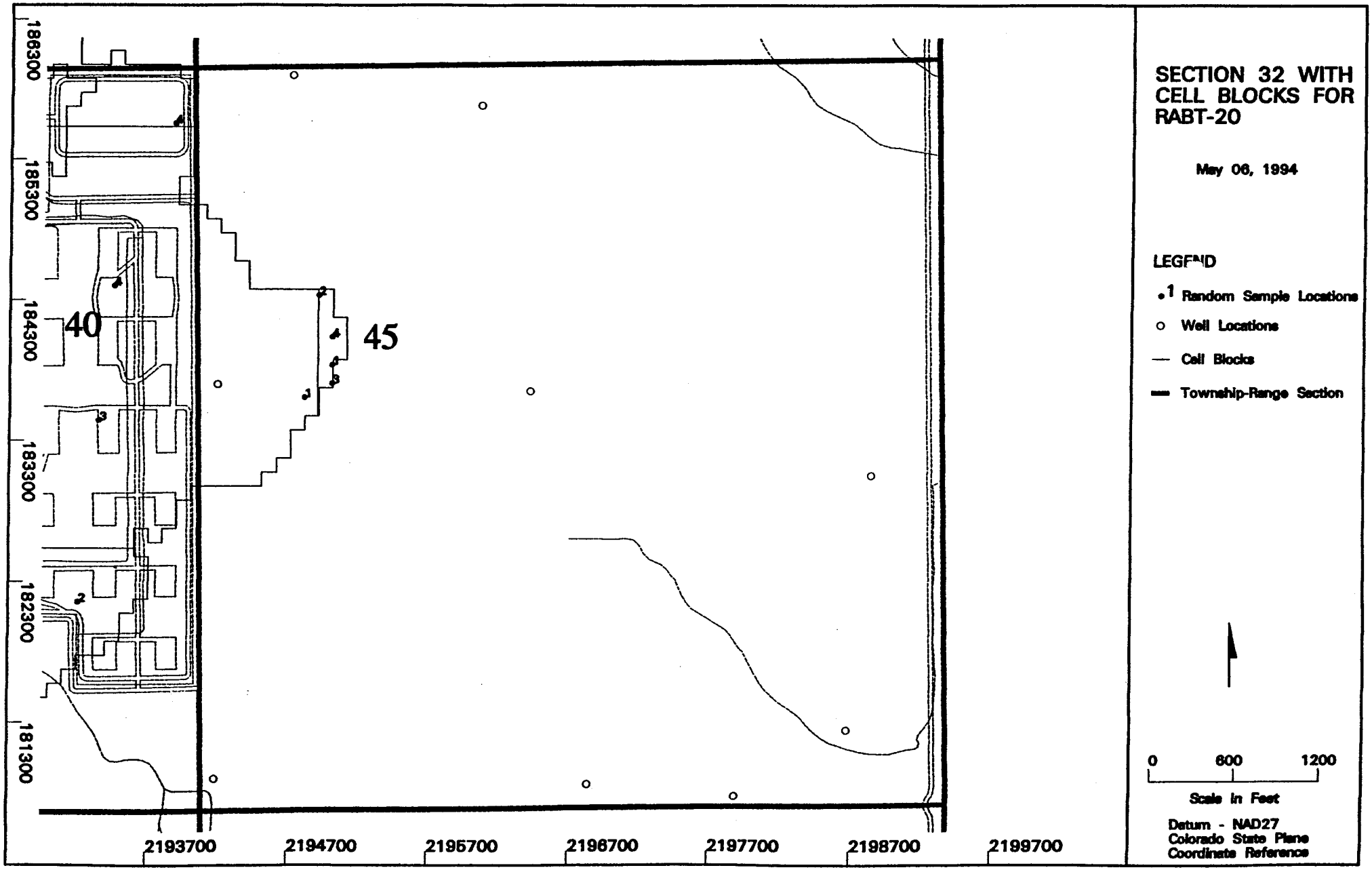

SECTION 25 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
18
19
21
28
27
24
23
191500
190500
189500
188500
187500
186500
2183200
2184200
2185200
2186200
2187200
2188200
2189200
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 26 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
16
17
18
20
26
27
28
22
31
191400
190400
189400
188400
187400
186400
2178000
2179000
2180000
2181000
2182000
2183000
2184000
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 27 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
16
20
22
191400
190400
189400
188400
187400
186400
2172600
2173600
2174600
2175600
2176600
2177600
2178600
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


191500
190500
189500
188500
187500
186500
21
25
30
29
2188400
2189400
2190400
2191400
2192400
2193400
2194400
SECTION 30 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 31 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
29
40
39
55
56
57
186200
185200
184200
183200
182200
181200
2188500
2189500
2190500
2191500
2192500
2193500
2194500



SECTION 32 WITH CELL BLOCKS FOR RABT-20

May 06, 1994

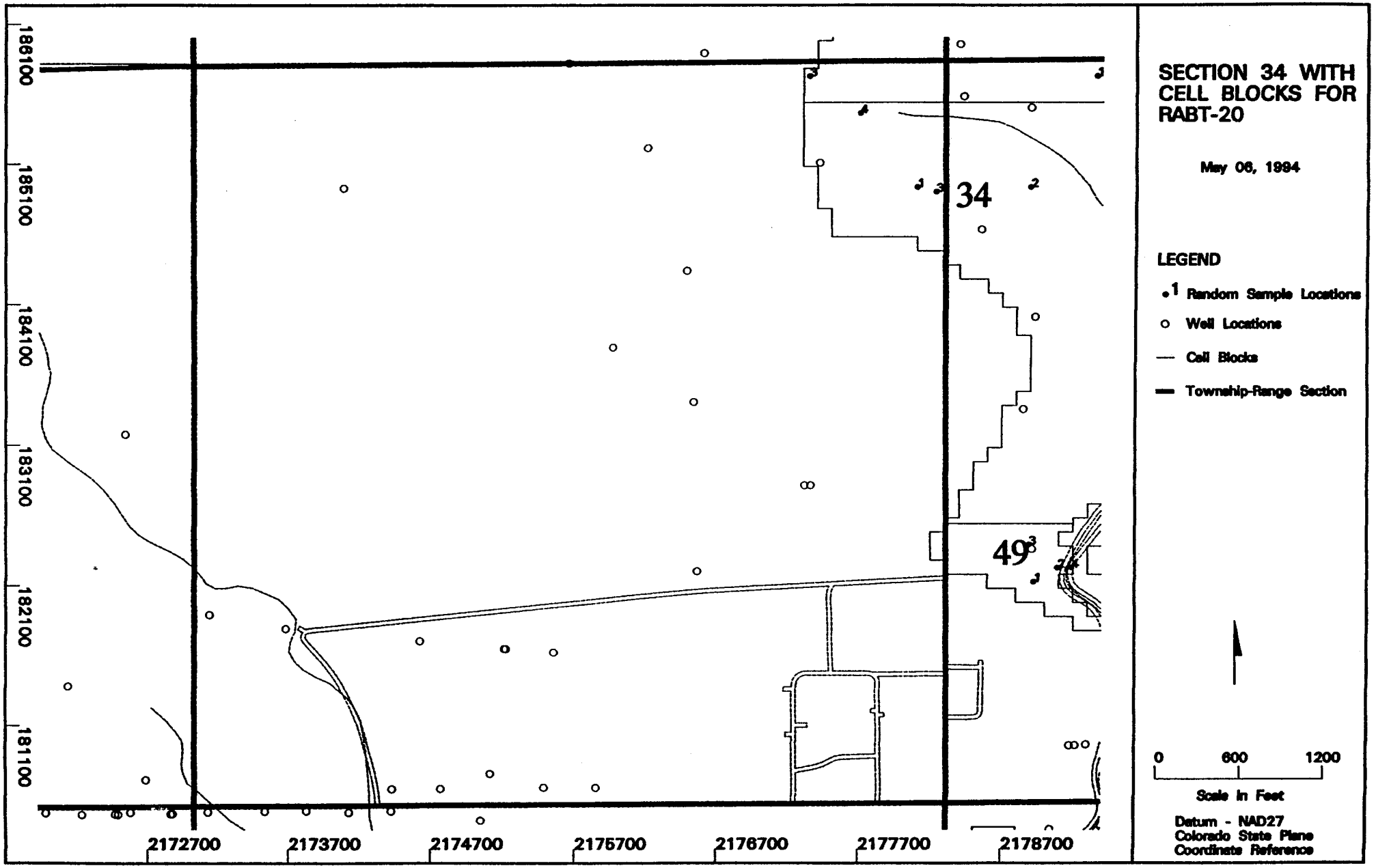
LEGEND

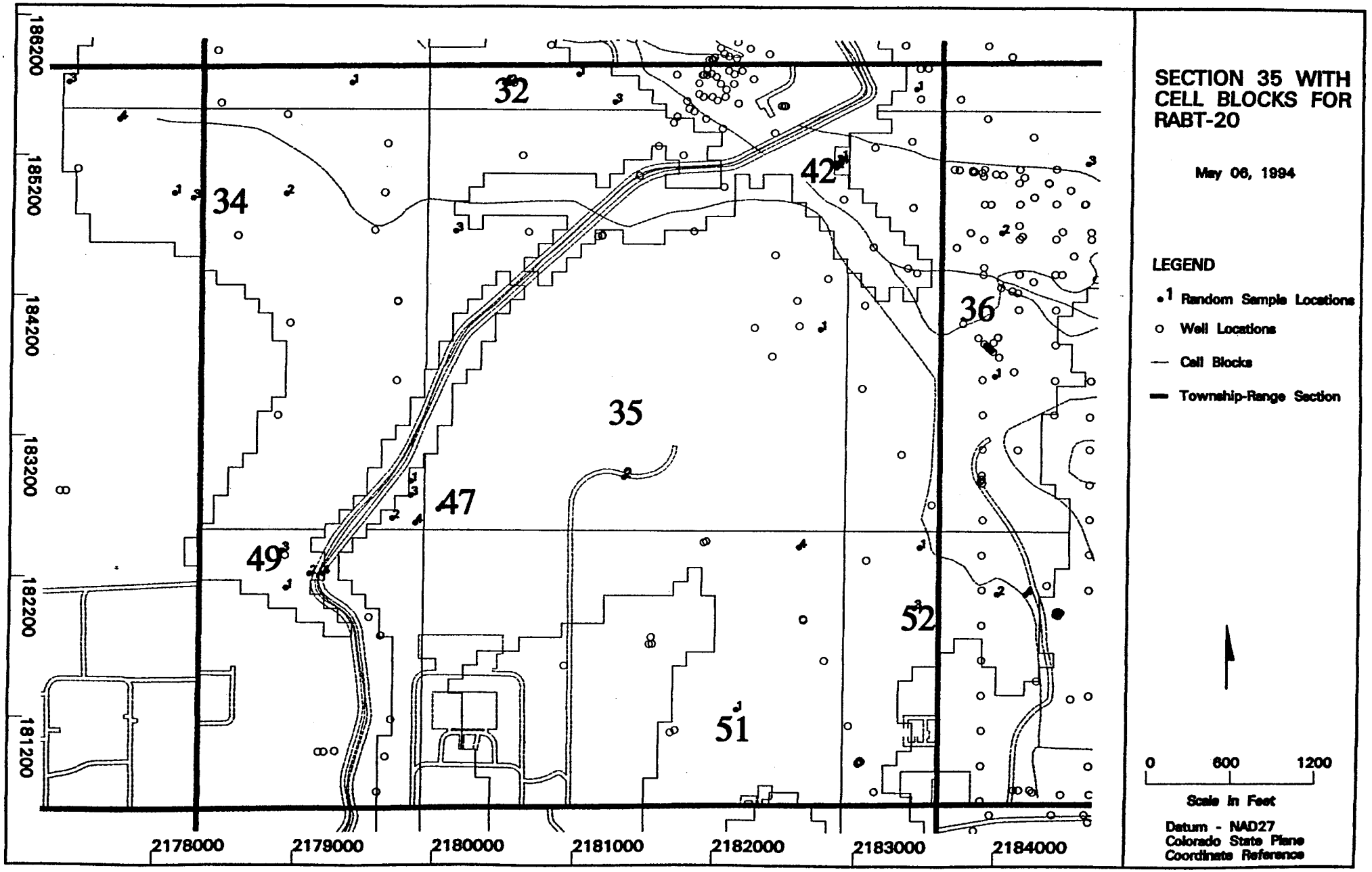
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

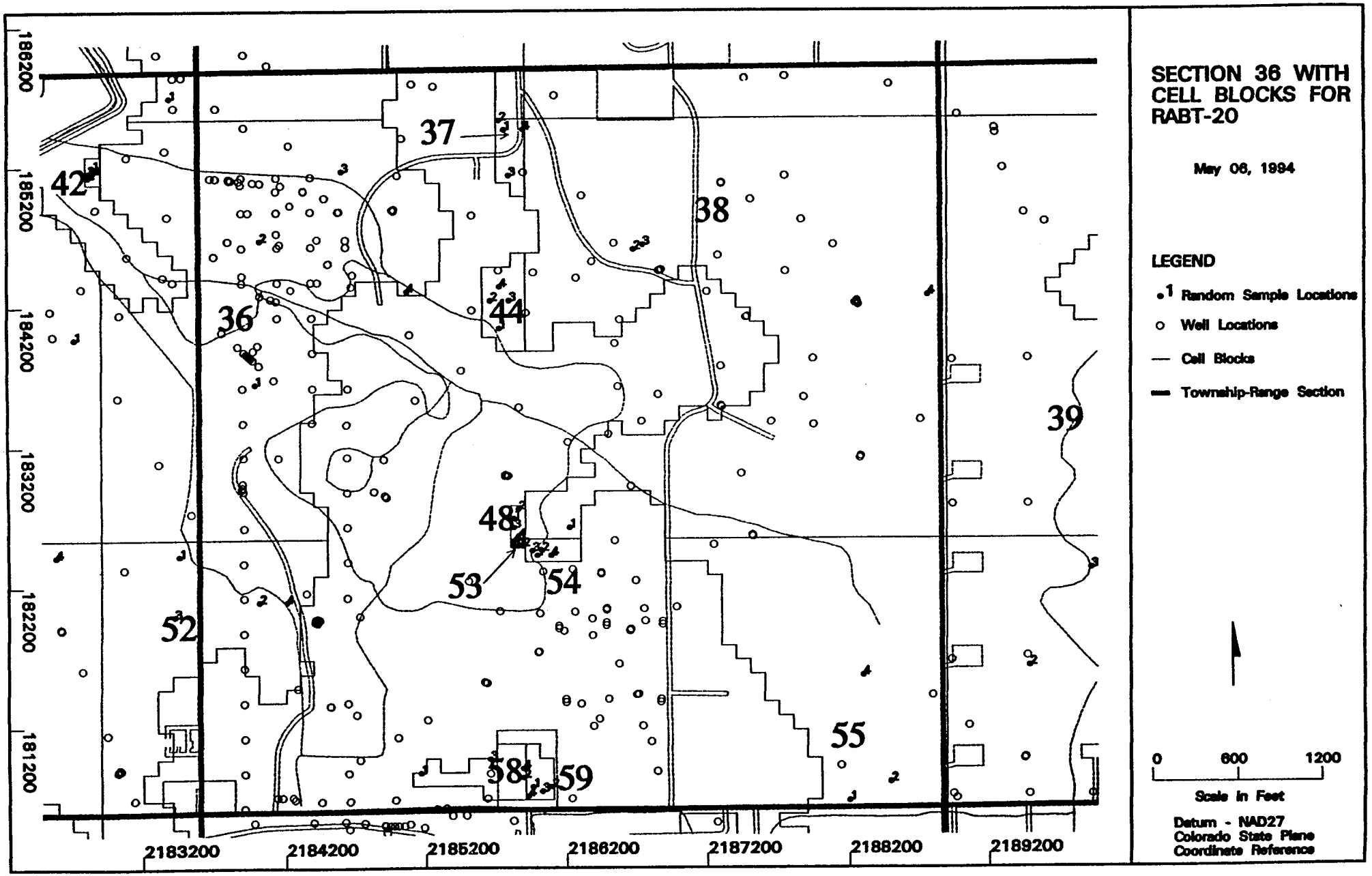
0 600 1200

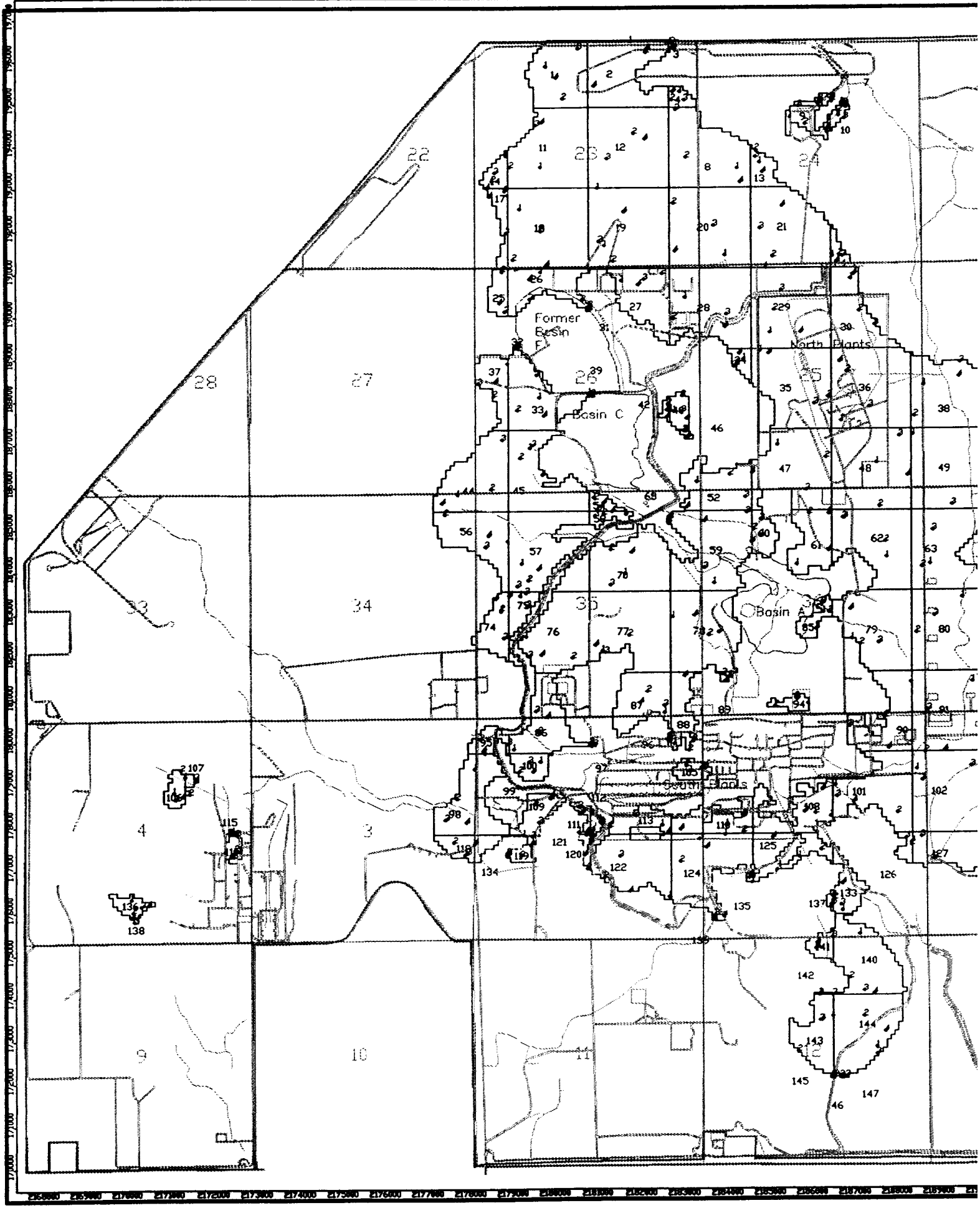
Scale In Feet

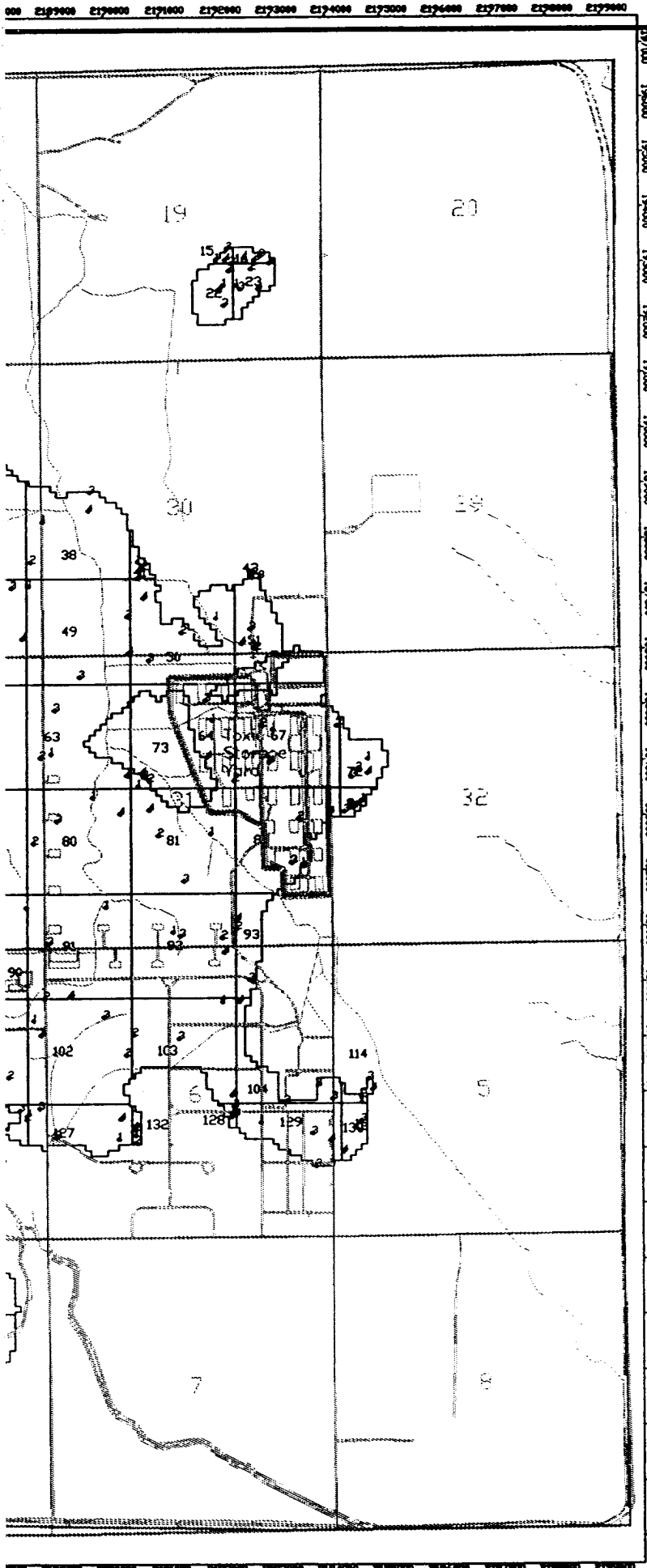
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 34 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
34
49
188100
186100
184100
183100
182100
181100
2172700
2173700
2174700
2175700
2176700
2177700
2178700
0
600
1200
Scale In Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 35 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
32
34
42
36
35
47
49
52
51
186200
185200
184200
183200
182200
181200
2178000
2179000
2180000
2181000
2182000
2183000
2184000
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 36 WITH CELL BLOCKS FOR RABT-20
May 06, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
186200
185200
184200
183200
182200
181200
2183200
2184200
2185200
2186200
2187200
2188200
2189200
37
38
39
42
36
44
48
53
54
52
55
58
59


Former Basin F
Basin C
Basin A
North Plants
South Plants



Legend

Sampling Block

Lake

31 Section Number

Section Line

-N-

0 2000 4000

Scale in Feet

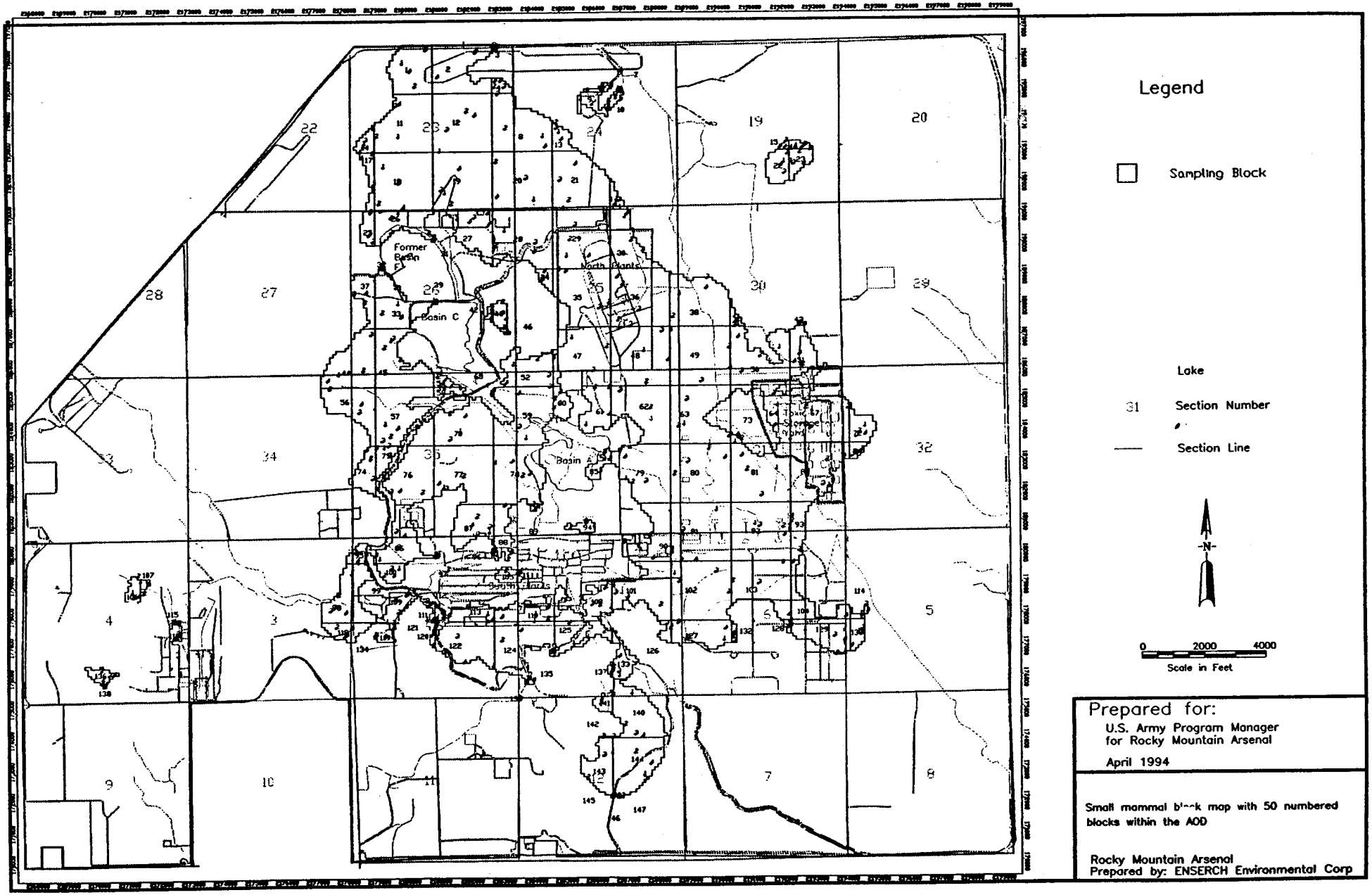
Prepared for:

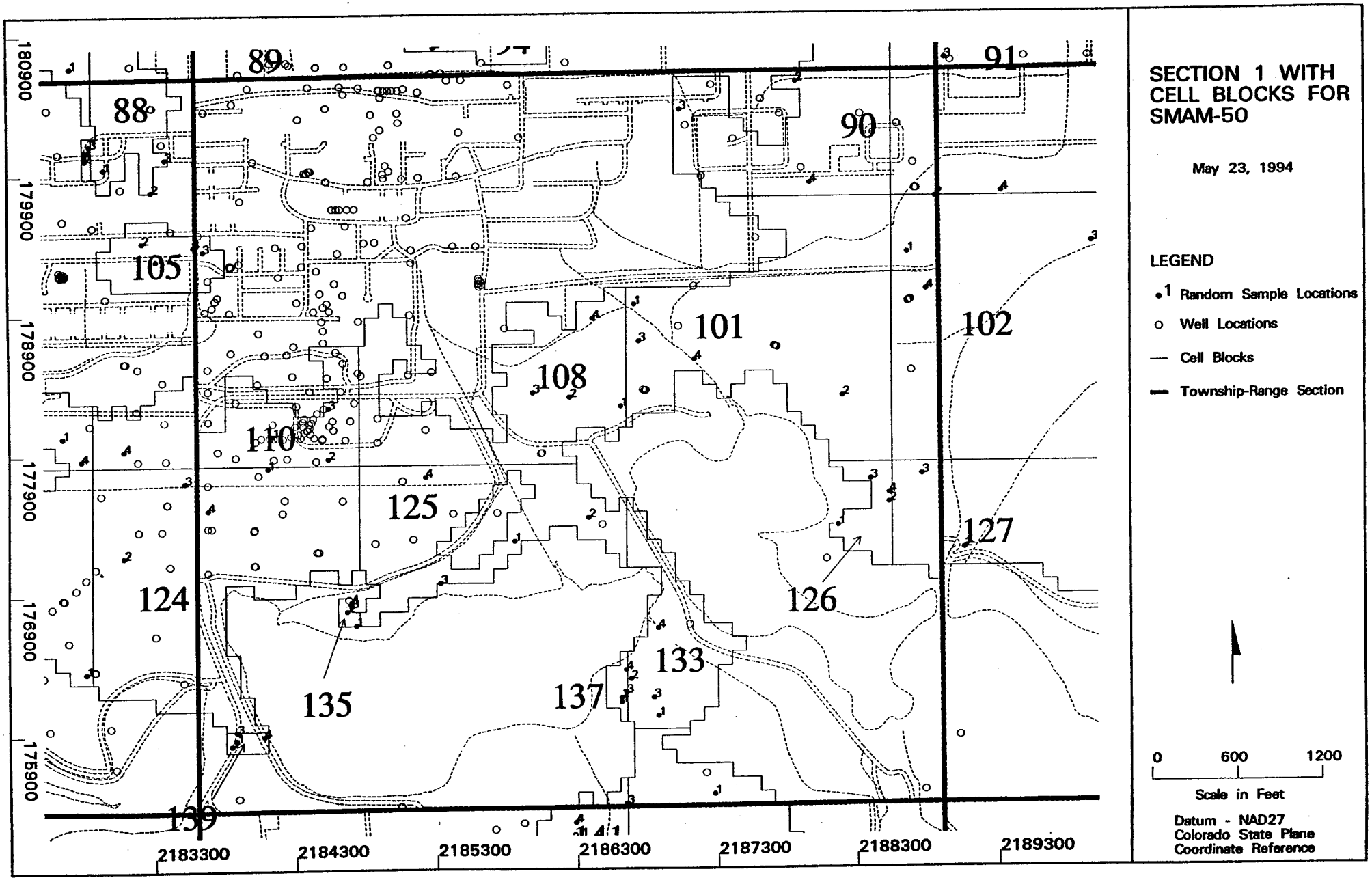
U.S. Army Program Manager
for Rocky Mountain Arsenal

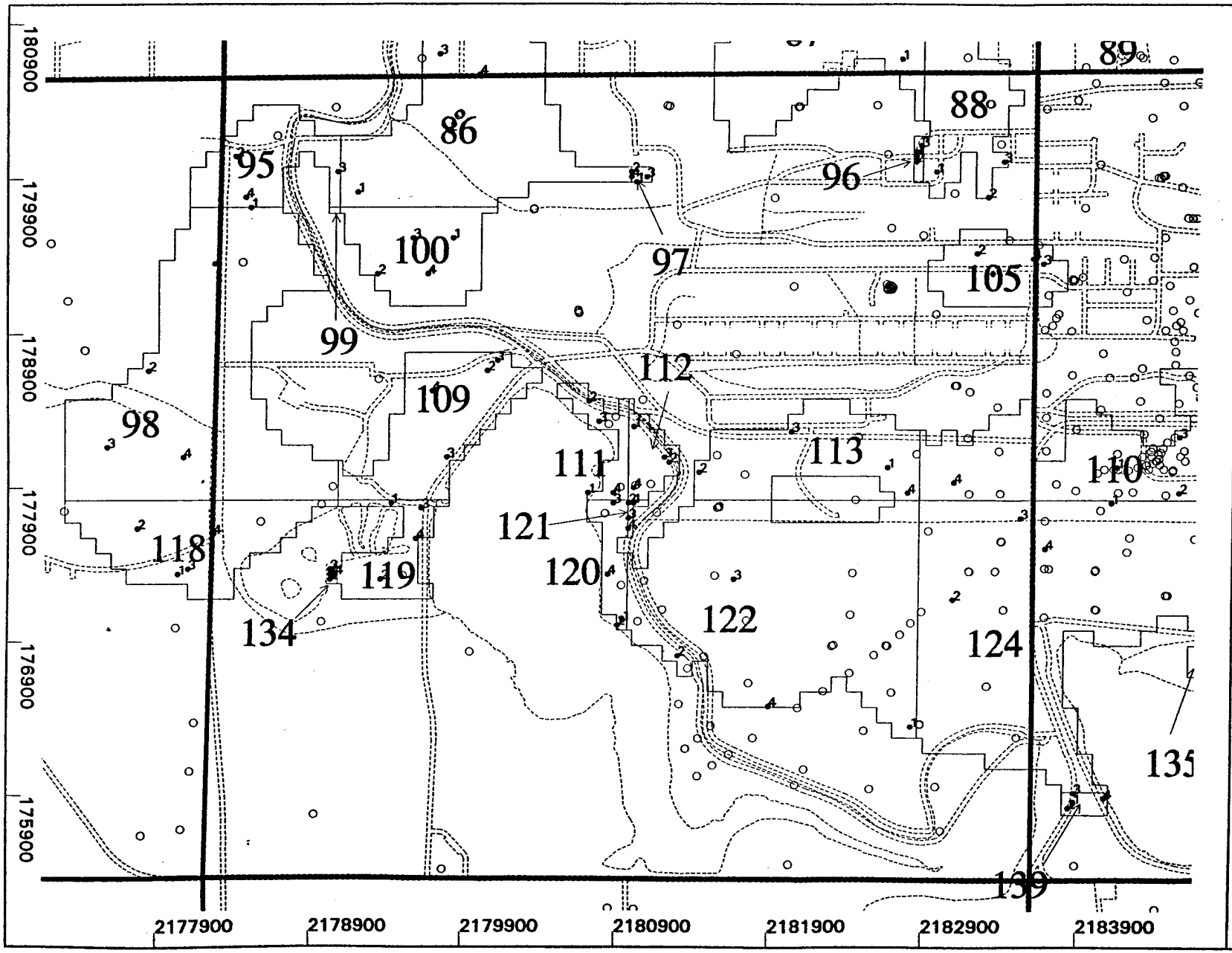
April 1994

Small mammal block map with 50 numbered blocks within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


Former Basin F
North Plants
Basin C
Basin A
Legend
Sampling Block
Lake
31 Section Number
Section Line
N
0 2000 4000
Scale in Feet
Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal
April 1994
Small mammal block map with 50 numbered blocks within the AOD
Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


SECTION 1 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
88
89
90
91
105
101
102
108
110
125
127
124
126
133
135
137
139
180900
179900
178900
177900
176900
175900
2183300
2184300
2185300
2186300
2187300
2188300
2189300



SECTION 2 WITH CELL BLOCKS FOR SMAM-50

May 23, 1994

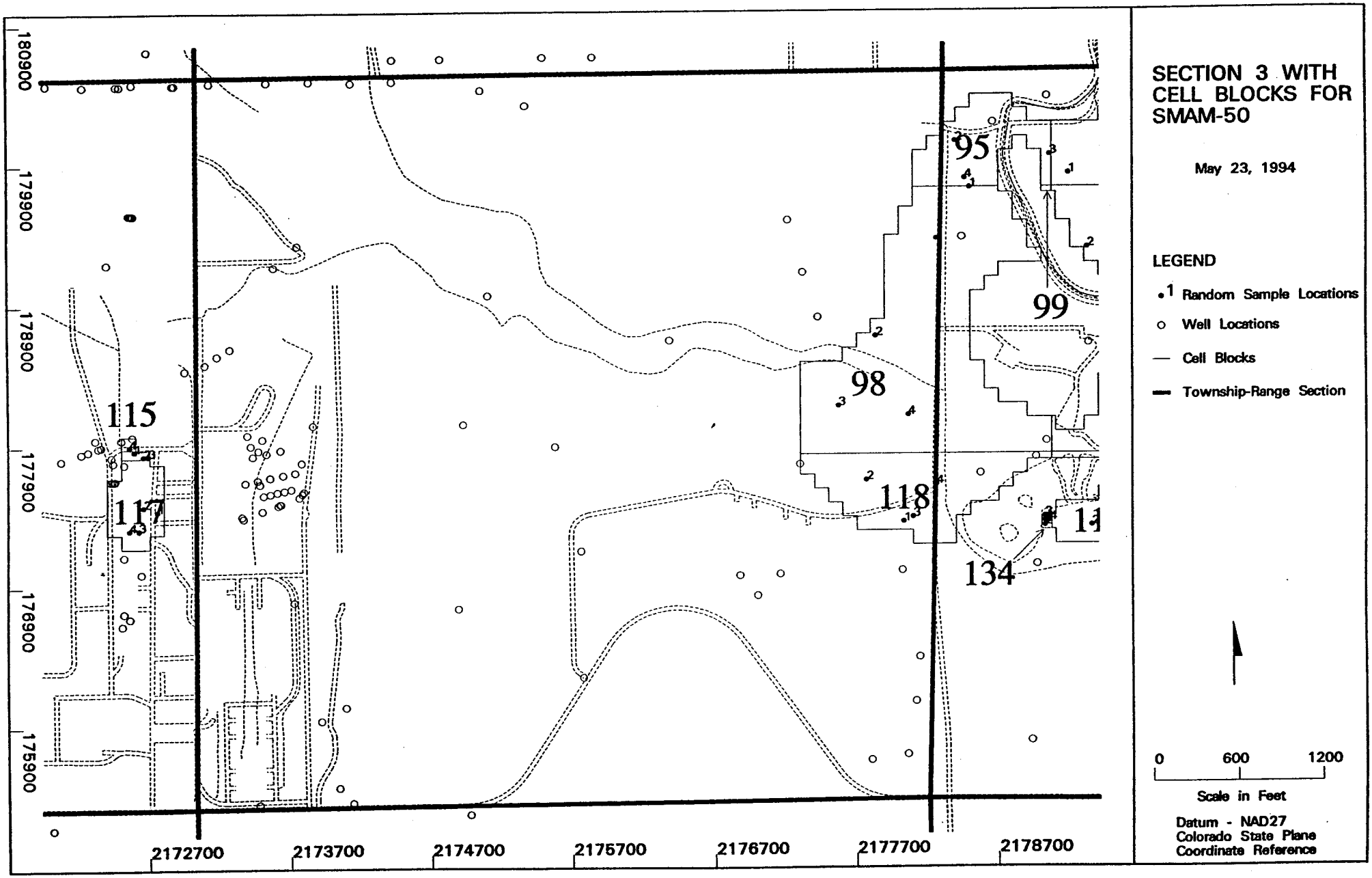
LEGEND

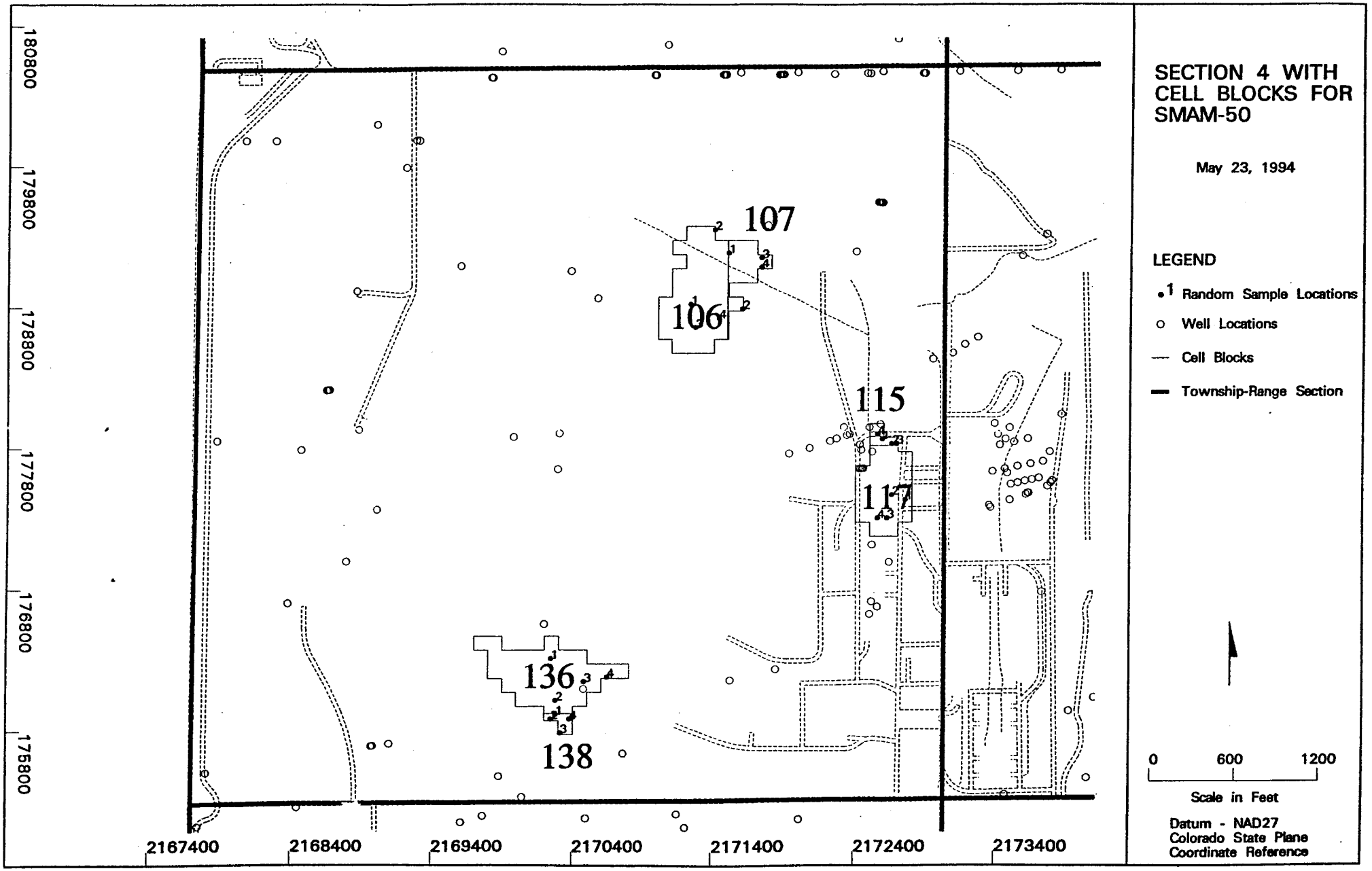
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

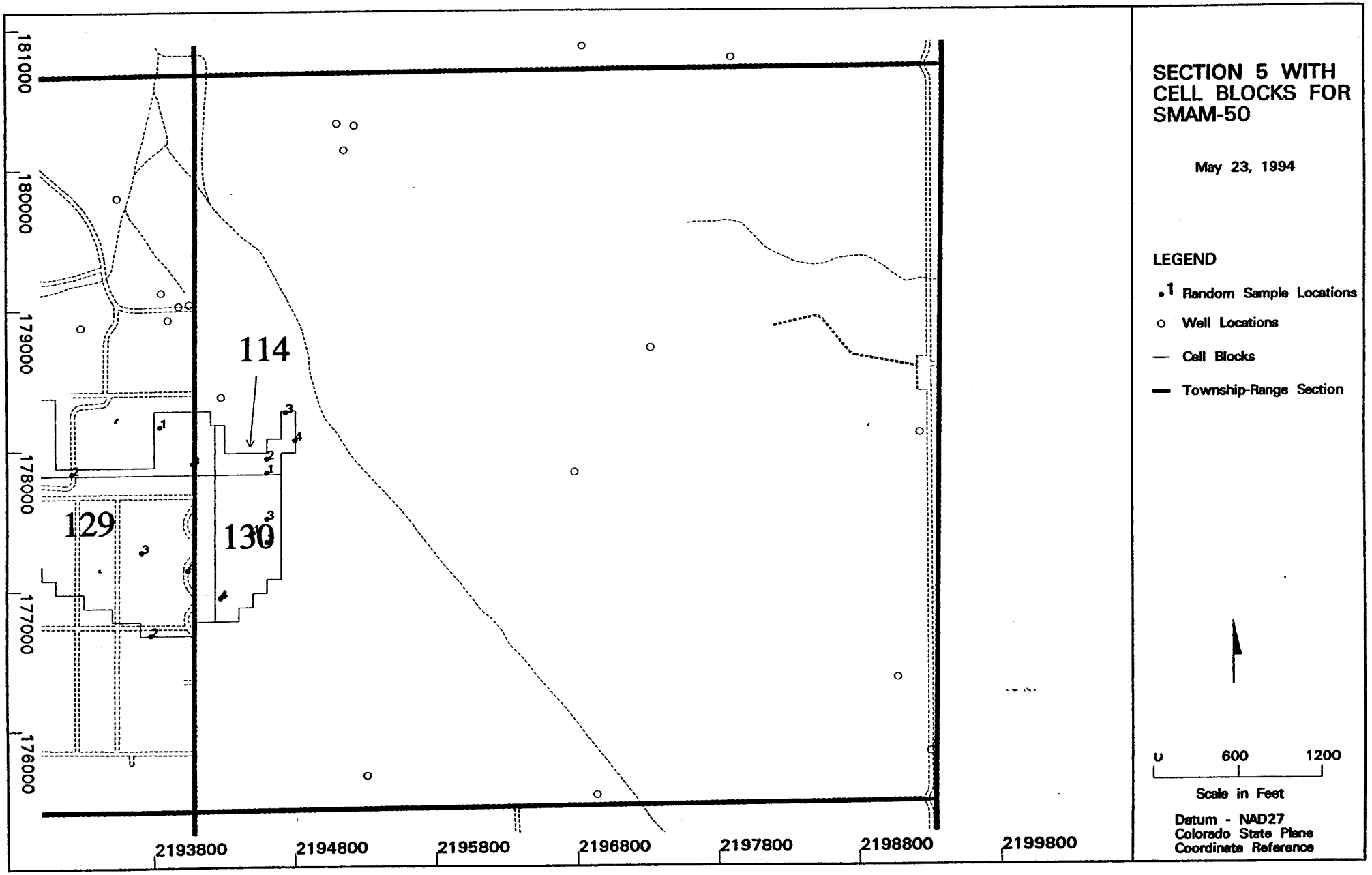
0 600 1200

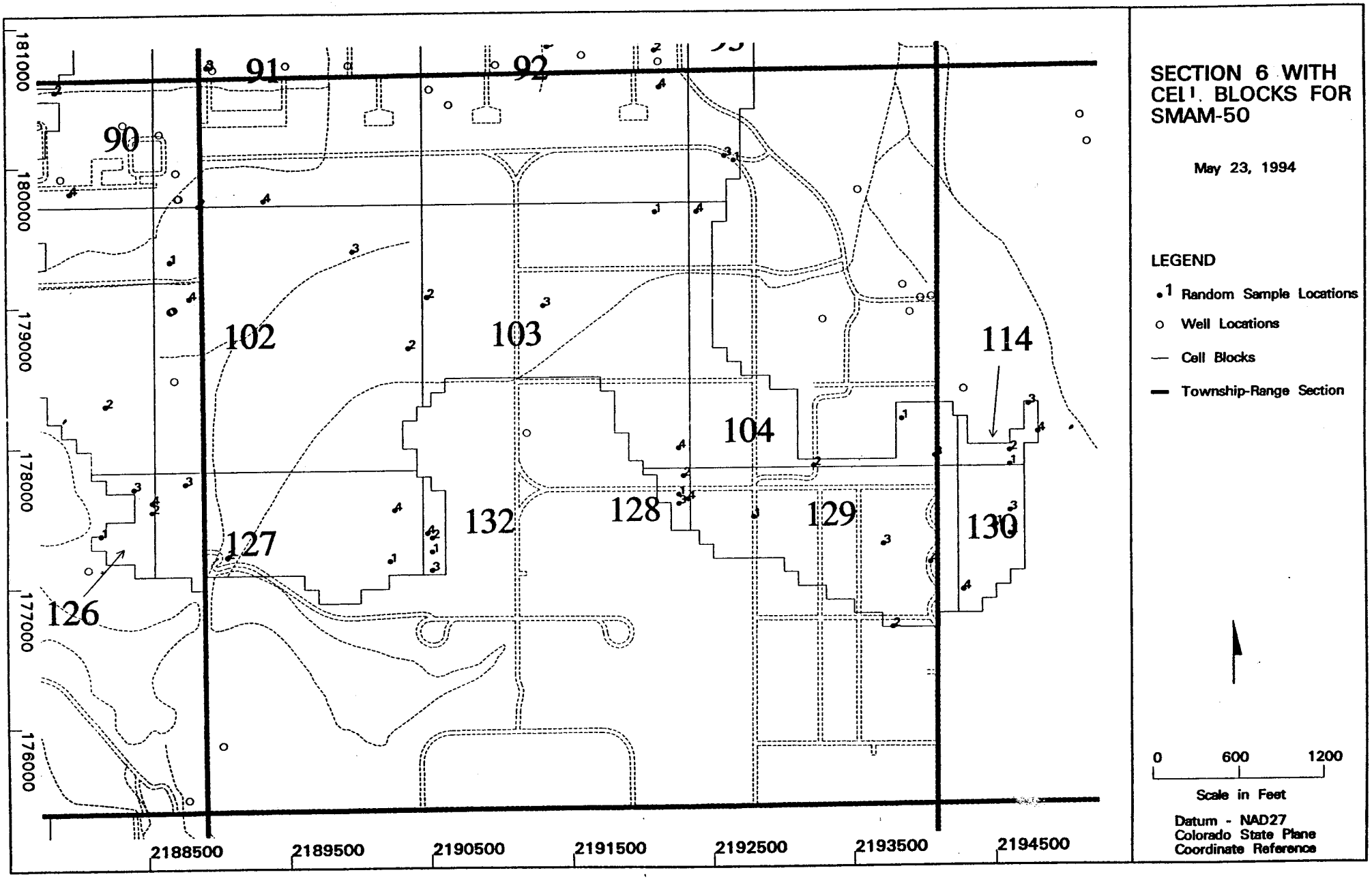
Scale in Feet

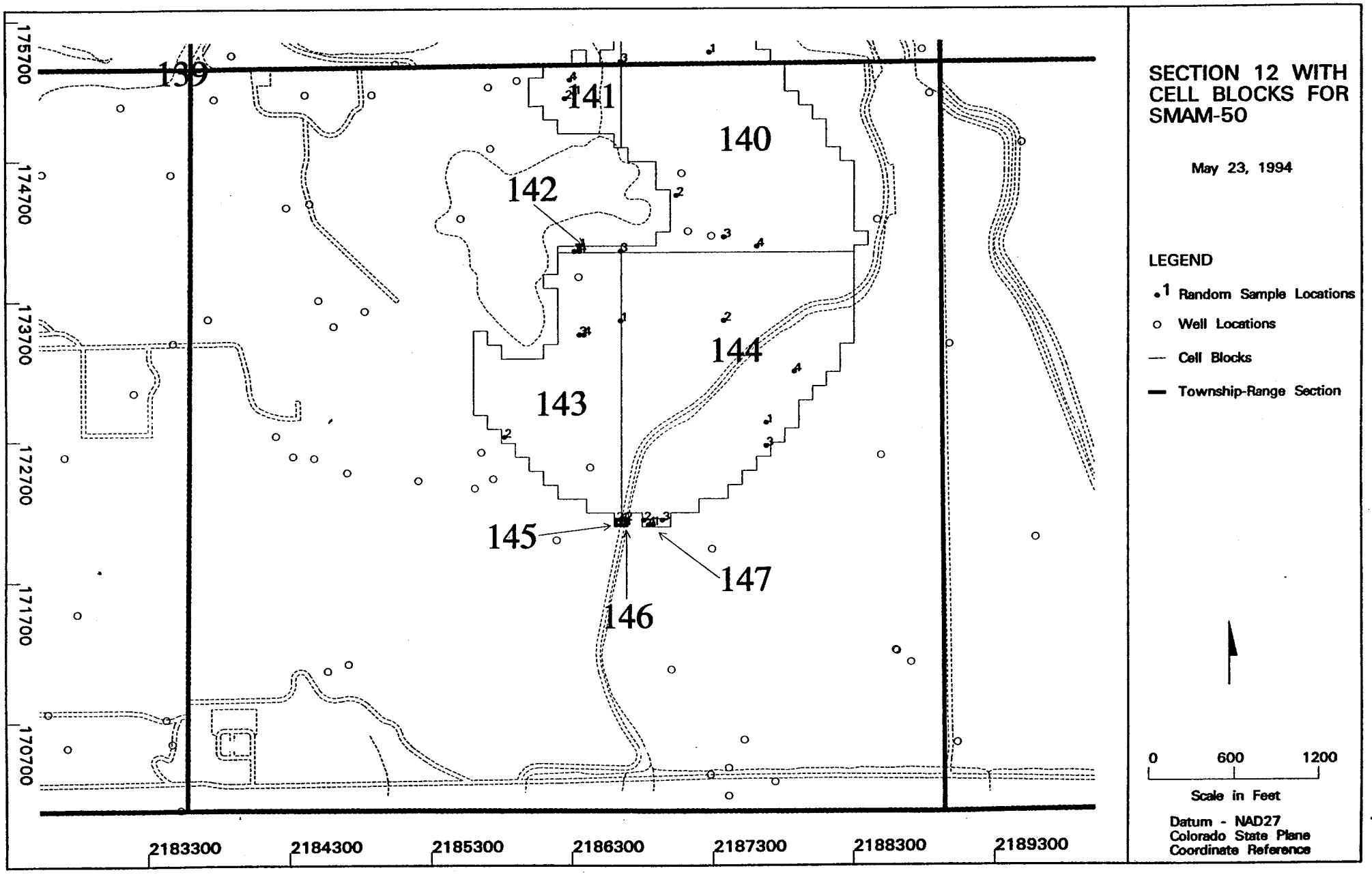
Datum - NAD27
Colorado State Plane
Coordinate Reference

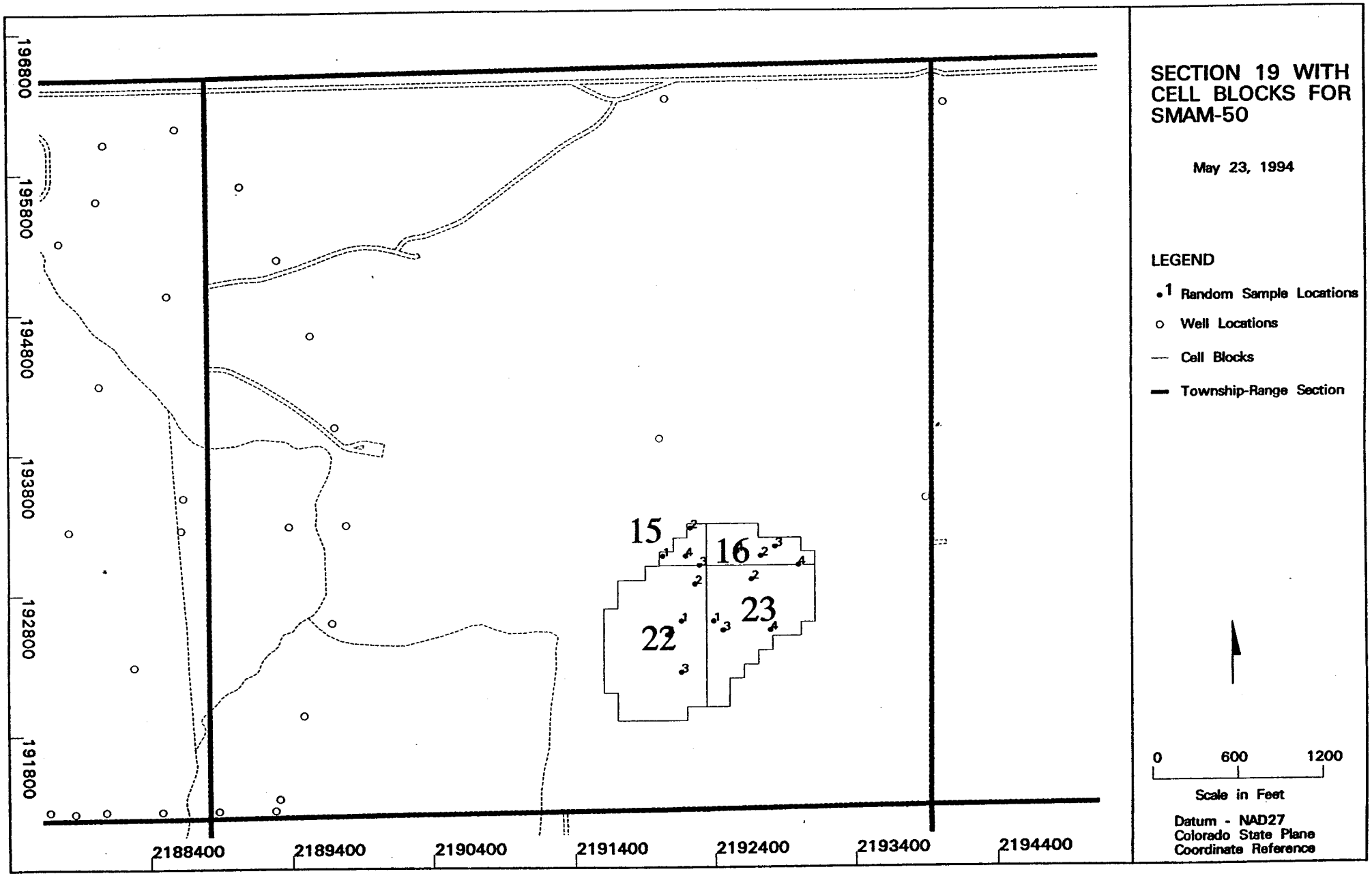

180900
179900
178900
177900
176900
175900
2172700
2173700
2174700
2175700
2176700
2177700
2178700
95
99
98
115
117
118
134
SECTION 3 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

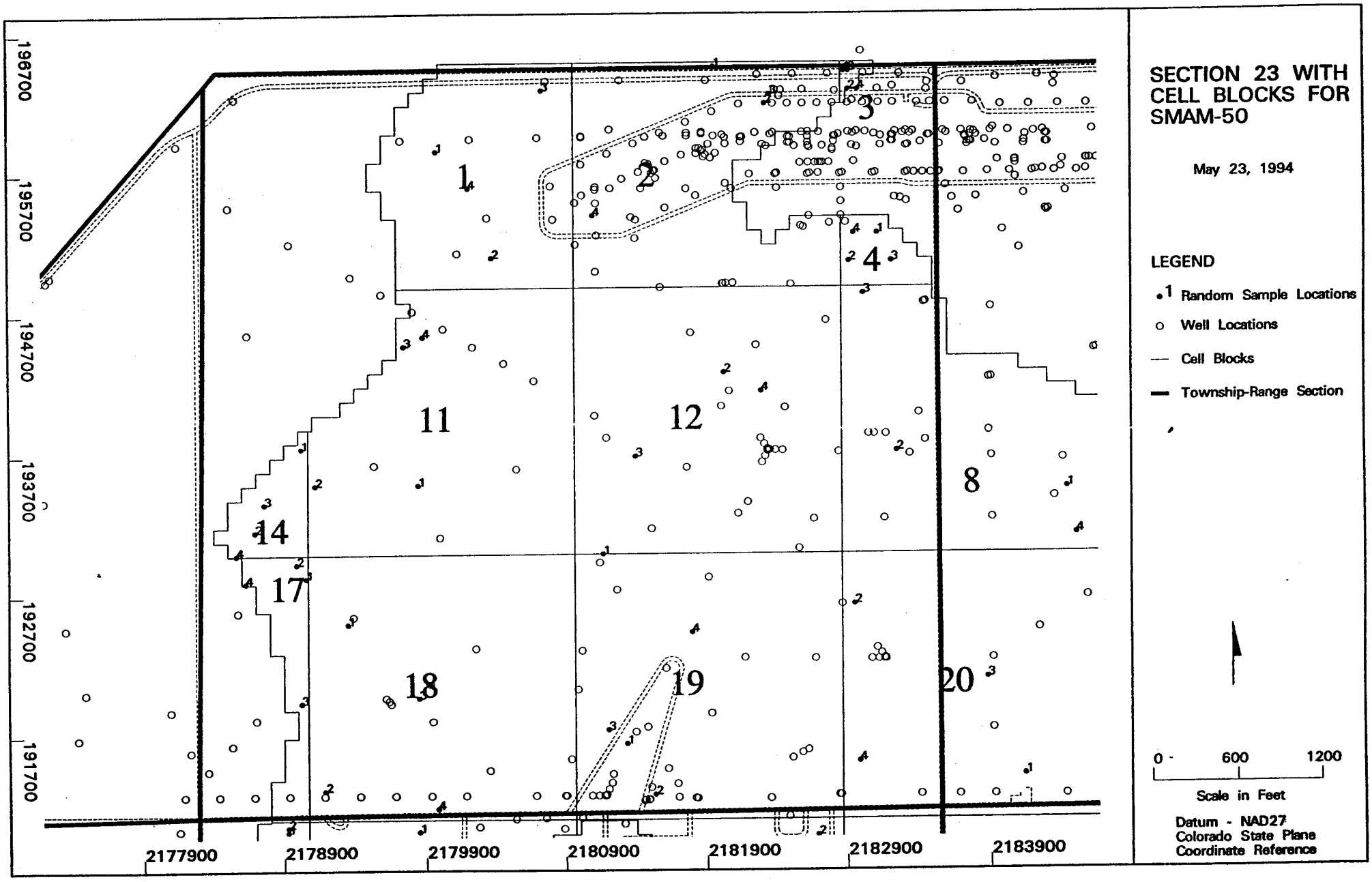

180800
179800
178800
177800
176800
175800
2167400
2168400
2169400
2170400
2171400
2172400
2173400
107
106
115
117
136
138
SECTION 4 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

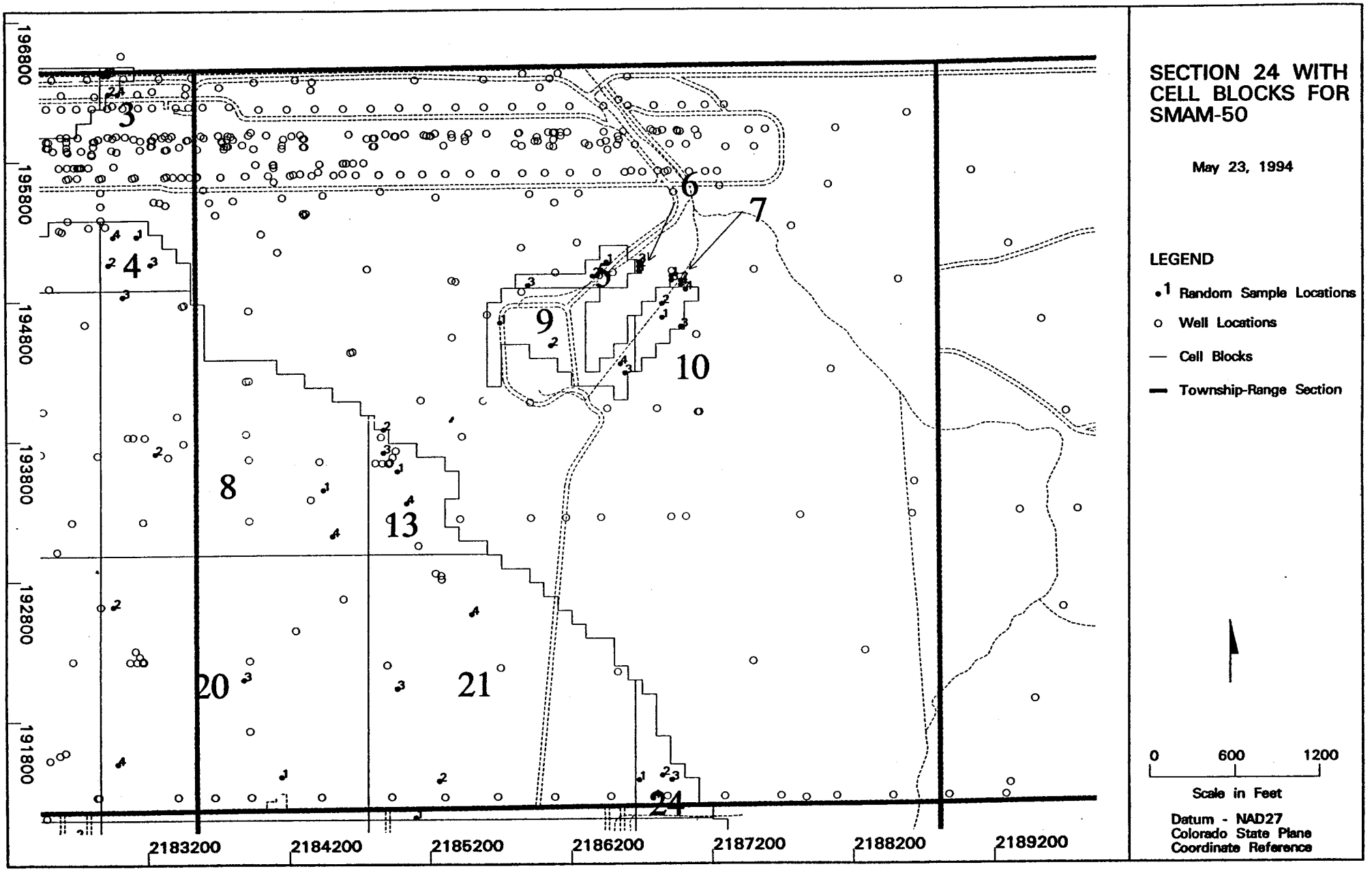

181000
180000
179000
178000
177000
176000
2193800
2194800
2195800
2196800
2197800
2198800
2199800
114
129
130
SECTION 5 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 6 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
91
92
90
102
103
114
104
132
128
129
130
127
126
181000
180000
179000
178000
177000
176000
2188500
2189500
2190500
2191500
2192500
2193500
2194500


SECTION 12 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
139
141
140
142
144
143
145
147
146
175700
174700
173700
172700
171700
170700
2183300
2184300
2185300
2186300
2187300
2188300
2189300
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


196800
195800
194800
193800
192800
191800
2188400
2189400
2190400
2191400
2192400
2193400
2194400
15
16
22
23
SECTION 19 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 23 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
196700
195700
194700
193700
192700
191700
2177900
2178900
2179900
2180900
2181900
2182900
2183900
1
2
3
4
8
11
12
14
17
18
19
20



SECTION 24 WITH CELL BLOCKS FOR SMAM-50

May 23, 1994

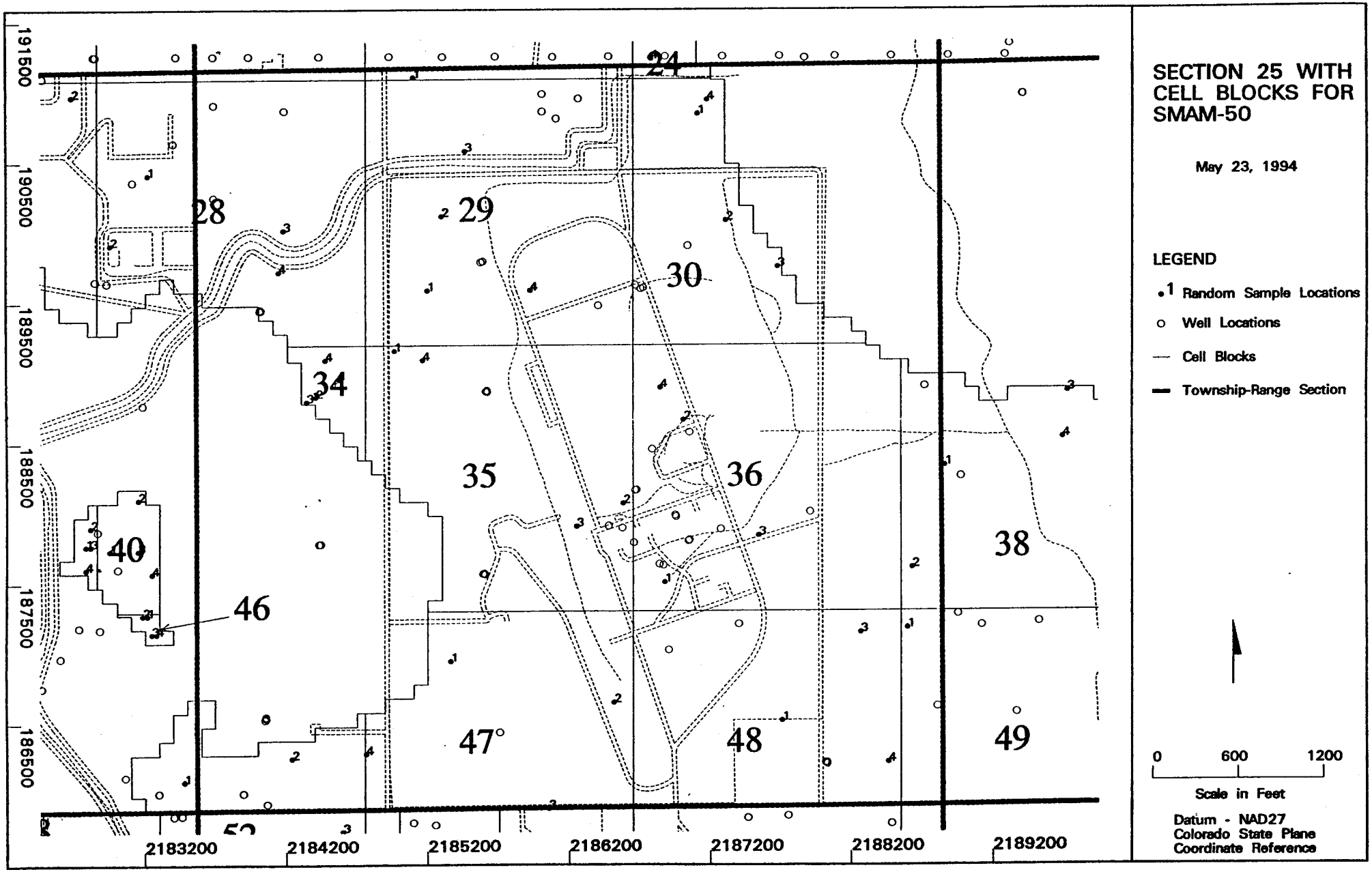
LEGEND

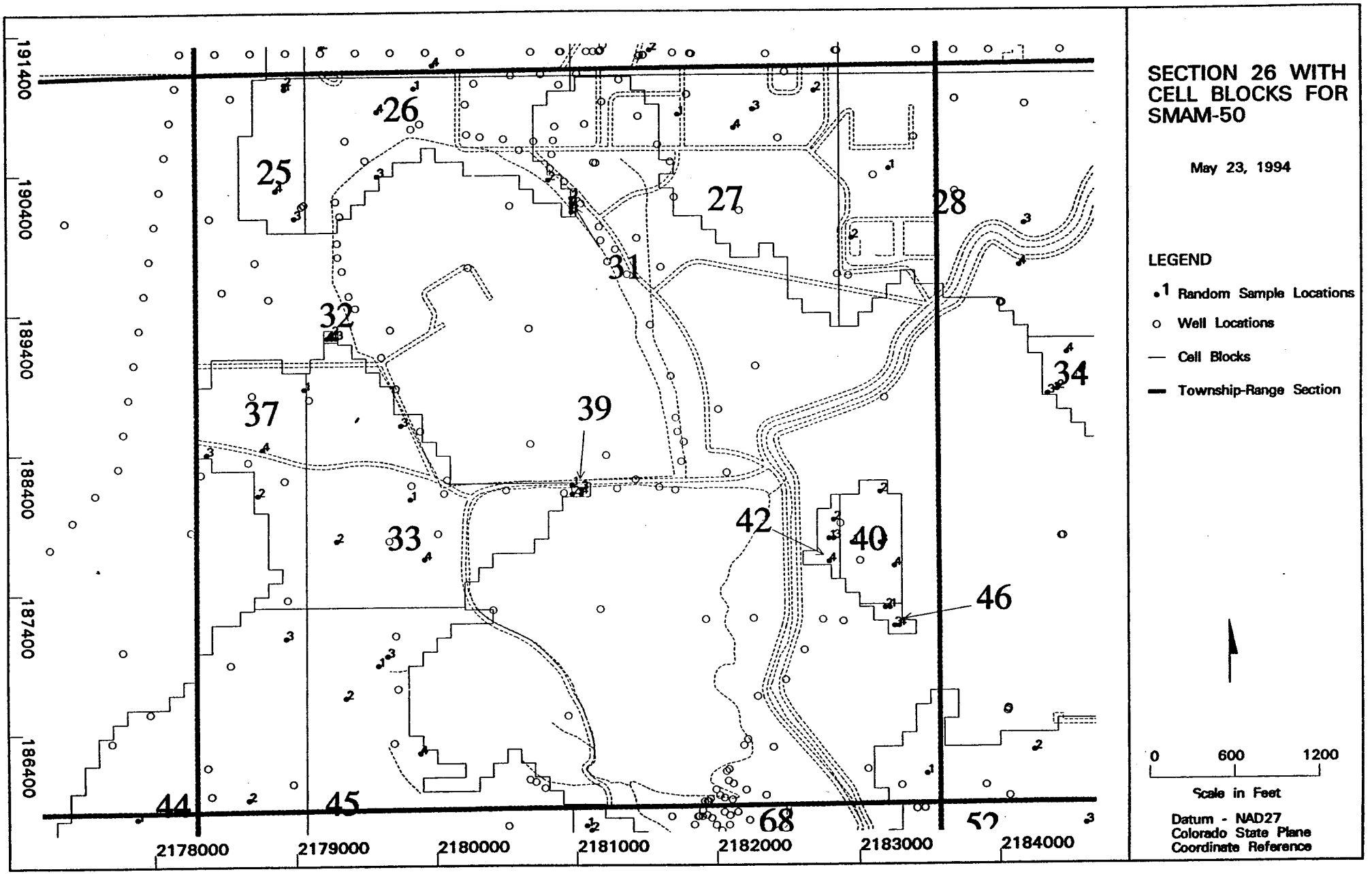
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

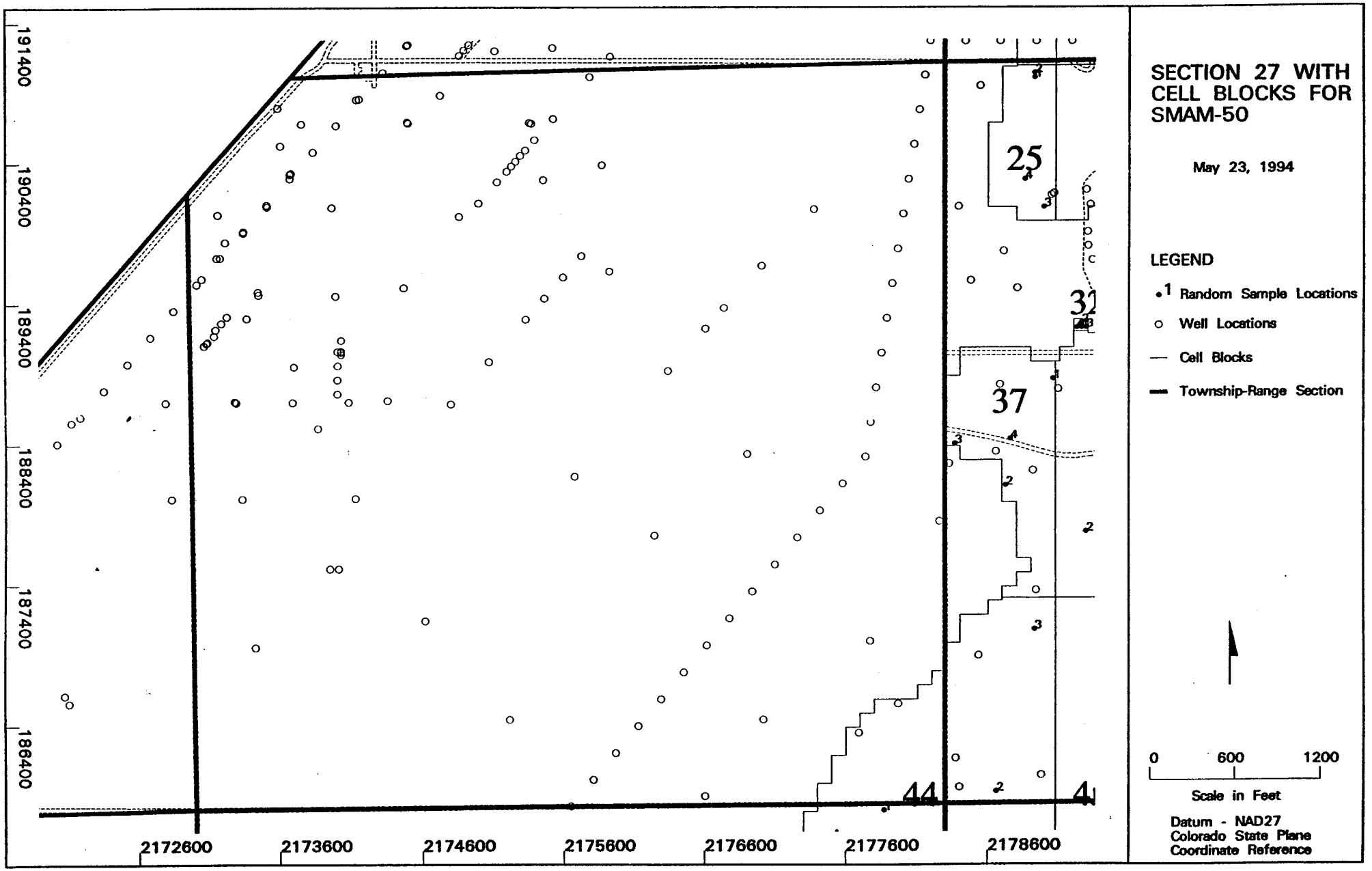
0 600 1200

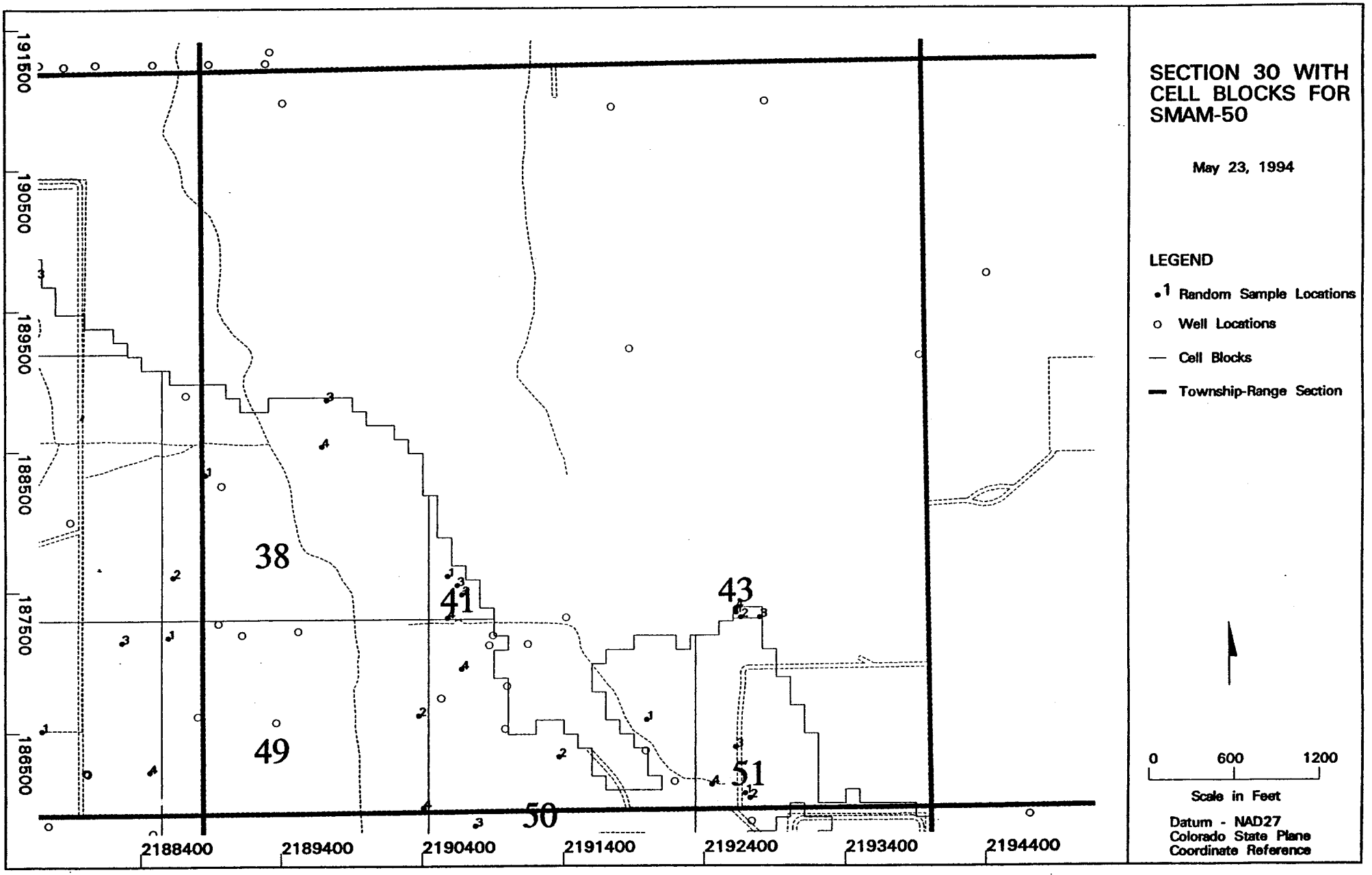
Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 25 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
24
28
29
30
34
35
36
38
40
46
47
48
49
191500
190500
189500
188500
187500
186500
2183200
2184200
2185200
2186200
2187200
2188200
2189200


SECTION 26 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
191400
190400
189400
188400
187400
186400
2178000
2179000
2180000
2181000
2182000
2183000
2184000
26
25
27
28
31
32
34
37
39
42
40
46
33
44
45
68
52


191400
190400
189400
188400
187400
186400
2172600
2173600
2174600
2175600
2176600
2177600
2178600
25
32
37
44
4
SECTION 27 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 30 WITH CELL BLOCKS FOR SMAM-50

May 23, 1994

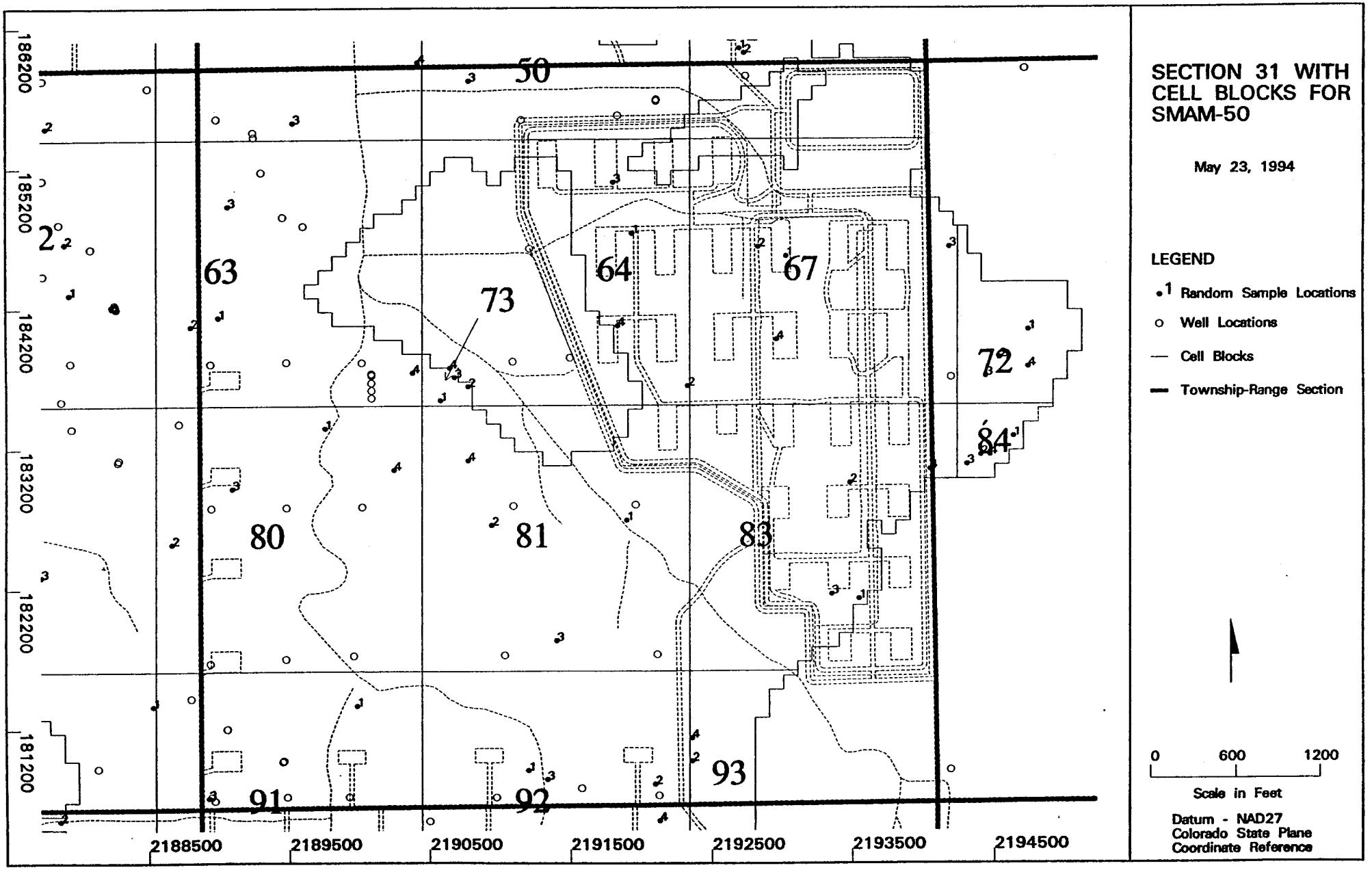
LEGEND

- 1 Random Sample Locations
- Well Locations
- Cell Blocks
- Township-Range Section

0 600 1200

Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 31 WITH CELL BLOCKS FOR SMAM-50

May 23, 1994

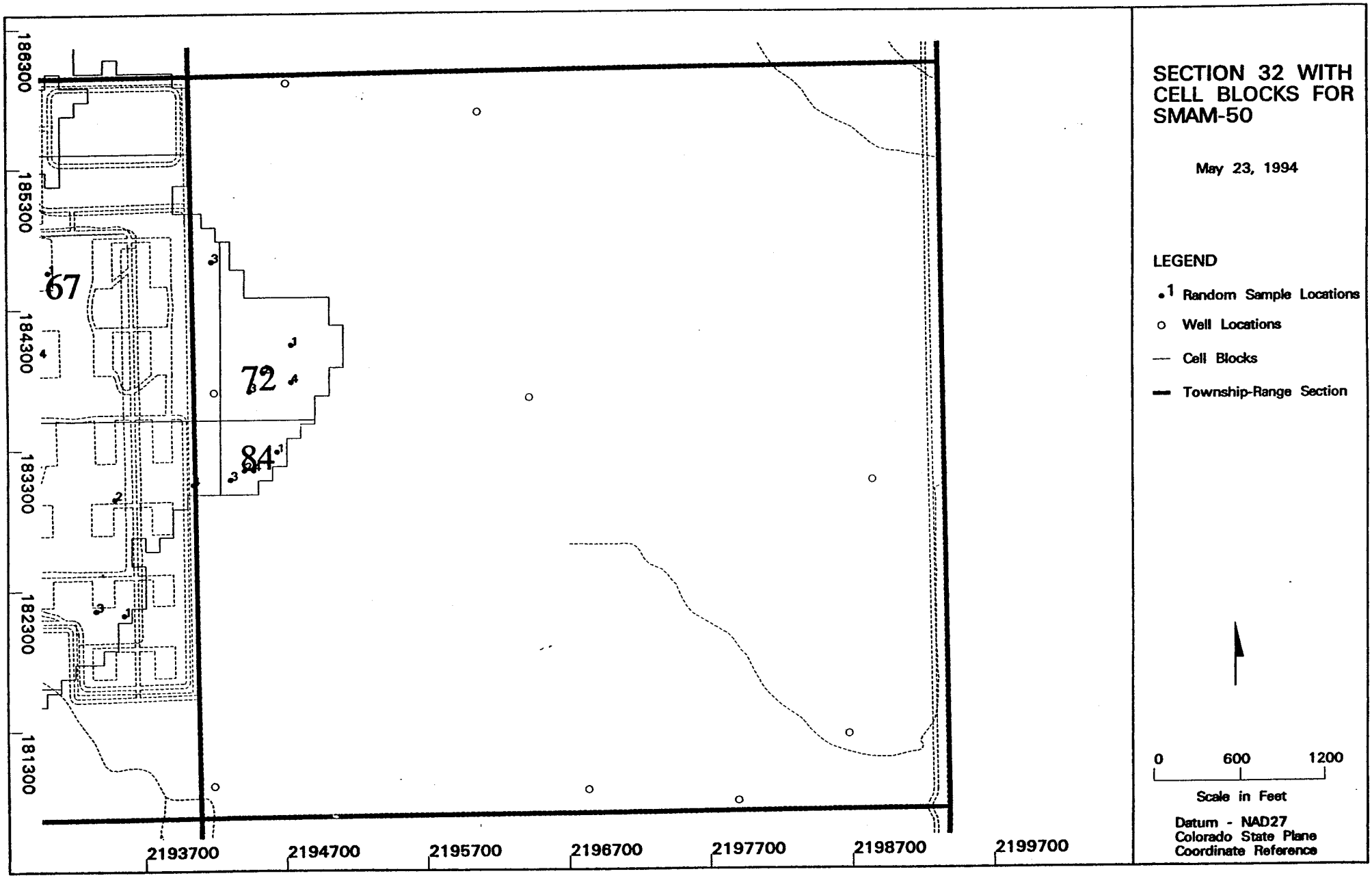
LEGEND

- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

0 600 1200

Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 32 WITH CELL BLOCKS FOR SMAM-50

May 23, 1994

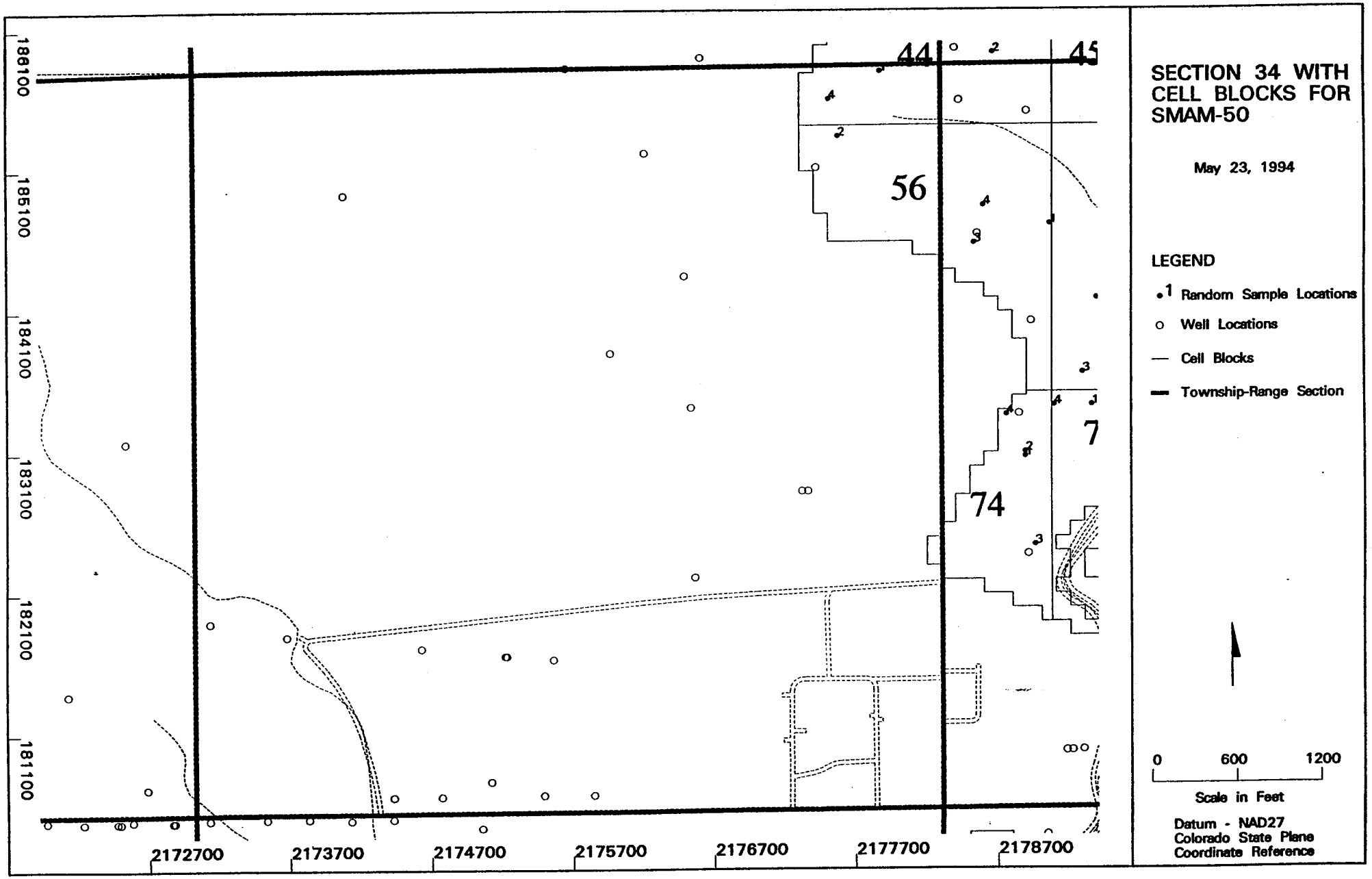
LEGEND

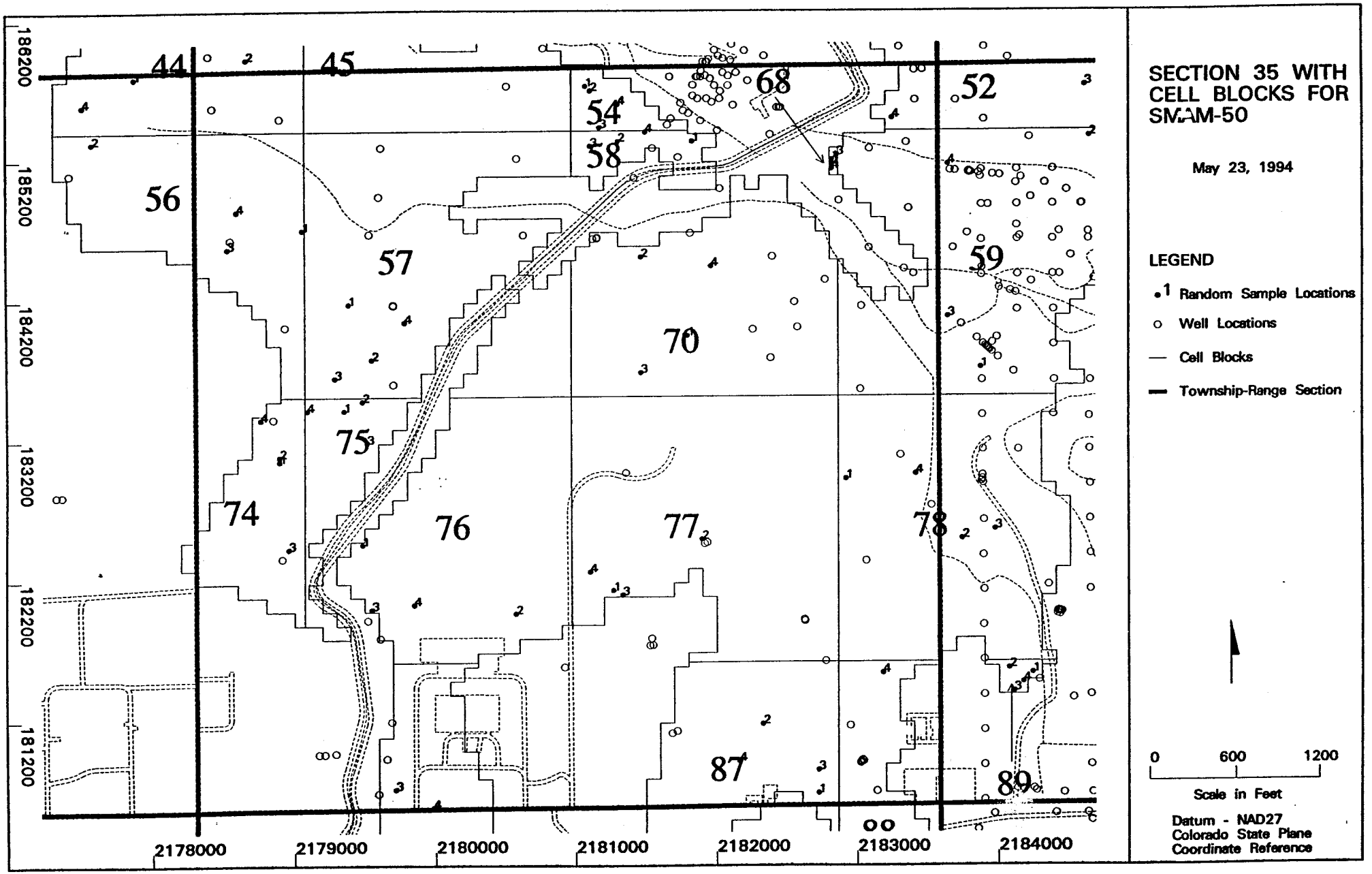
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

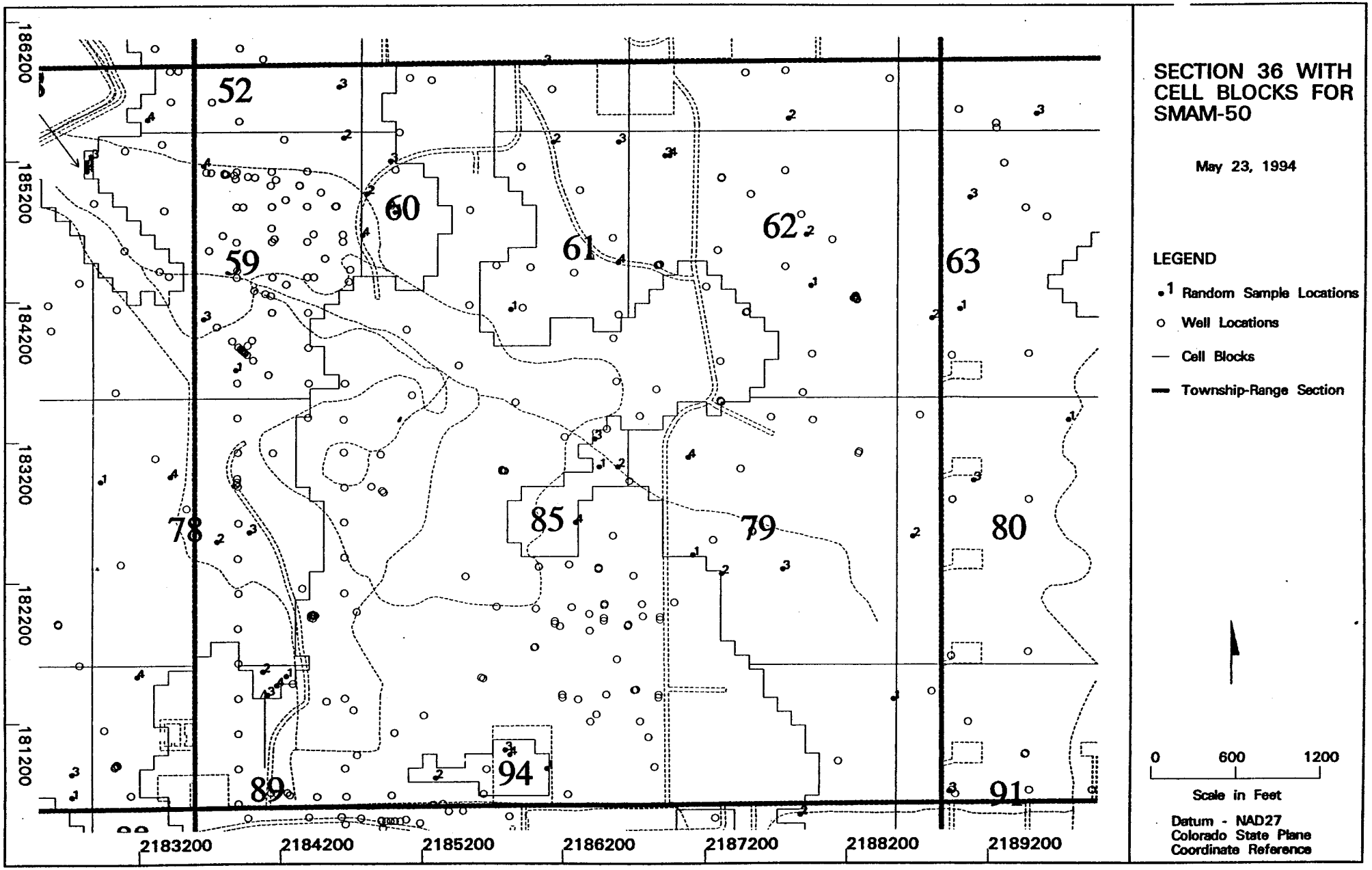
0 600 1200

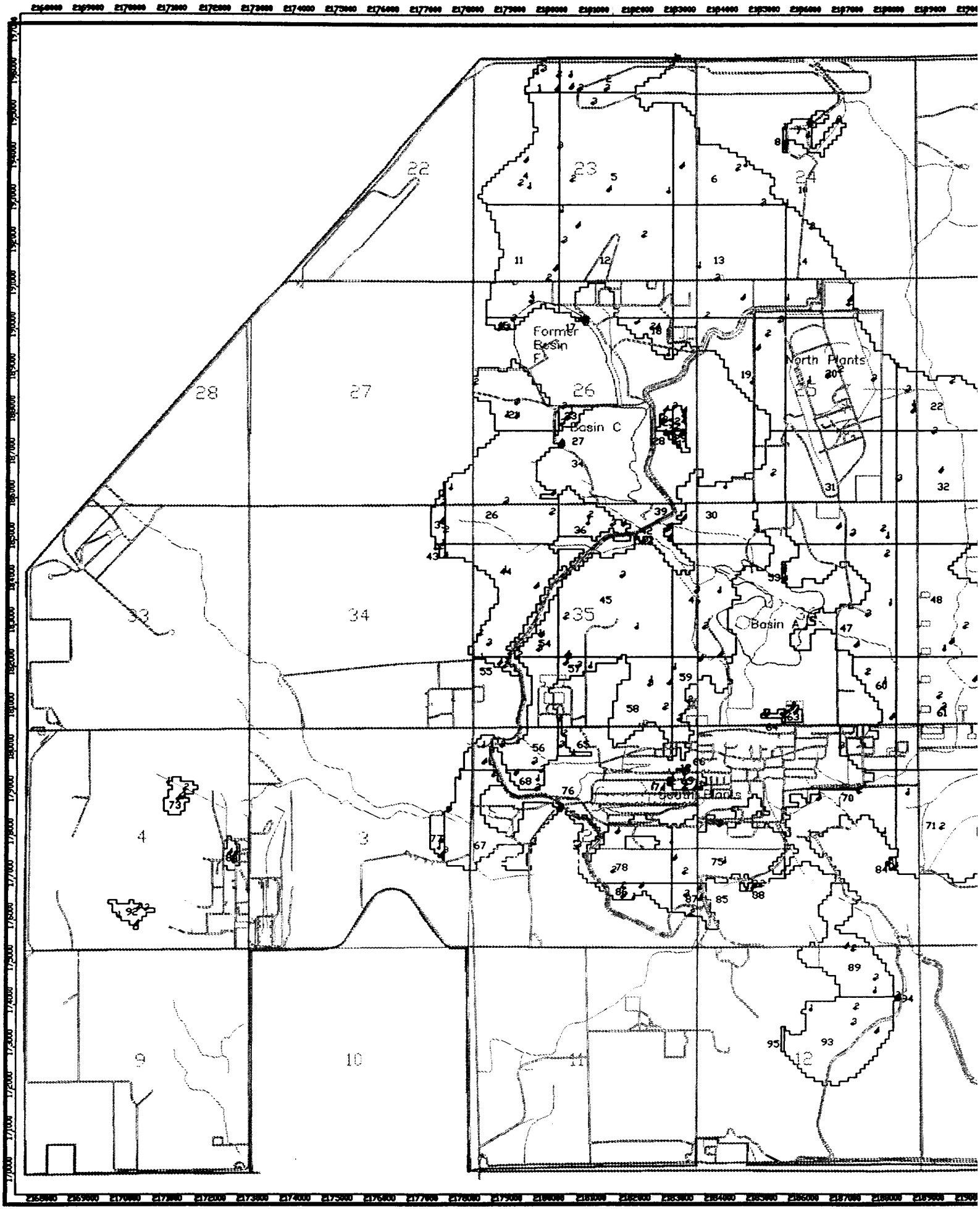
Scale in Feet

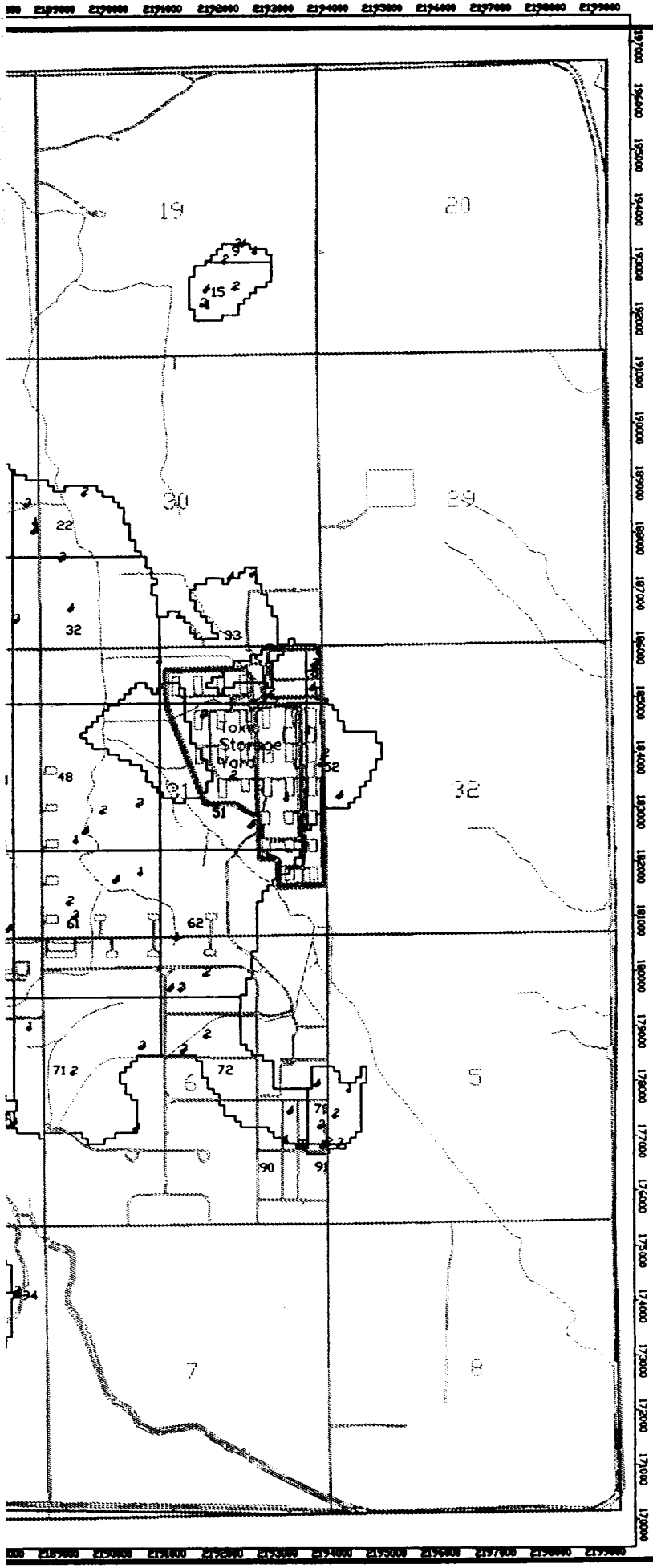
Datum - NAD27
Colorado State Plane
Coordinate Reference


186100
185100
184100
183100
182100
181100
2172700
2173700
2174700
2175700
2176700
2177700
2178700
44
45
56
74
7
SECTION 34 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 35 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
186200
185200
184200
183200
182200
181200
2178000
2179000
2180000
2181000
2182000
2183000
2184000
44
45
68
52
54
58
56
57
59
70
75
74
76
77
78
87
89


SECTION 36 WITH CELL BLOCKS FOR SMAM-50
May 23, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
52
60
61
62
63
59
78
85
79
80
94
89
91
186200
185200
184200
183200
182200
181200
2183200
2184200
2185200
2186200
2187200
2188200
2189200
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


Former Basin E
North Plants
Basin C
Basin A
South Plants



Legend

Sampling Block

Lake

31 Section Number

Section Line

N

0 2000 4000

Scale in Feet

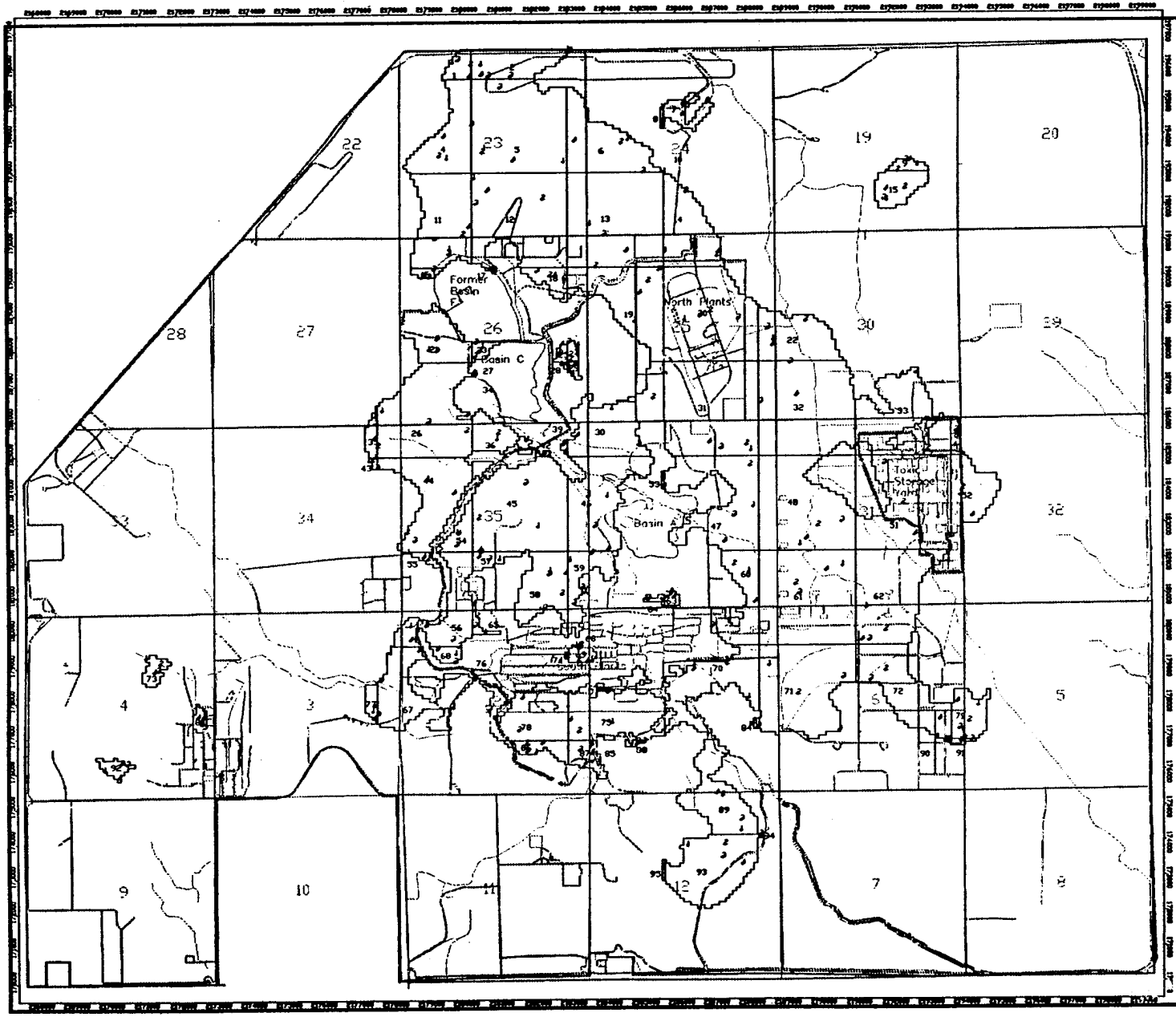
Prepared for:

U.S. Army Program Manager
for Rocky Mountain Arsenal

April 1994

Insect block map with 25 numbered blocks within the AOD

Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp



Legend

Sampling Block

Lake

31 Section Number

Section Line

-N-

0 2000 4000

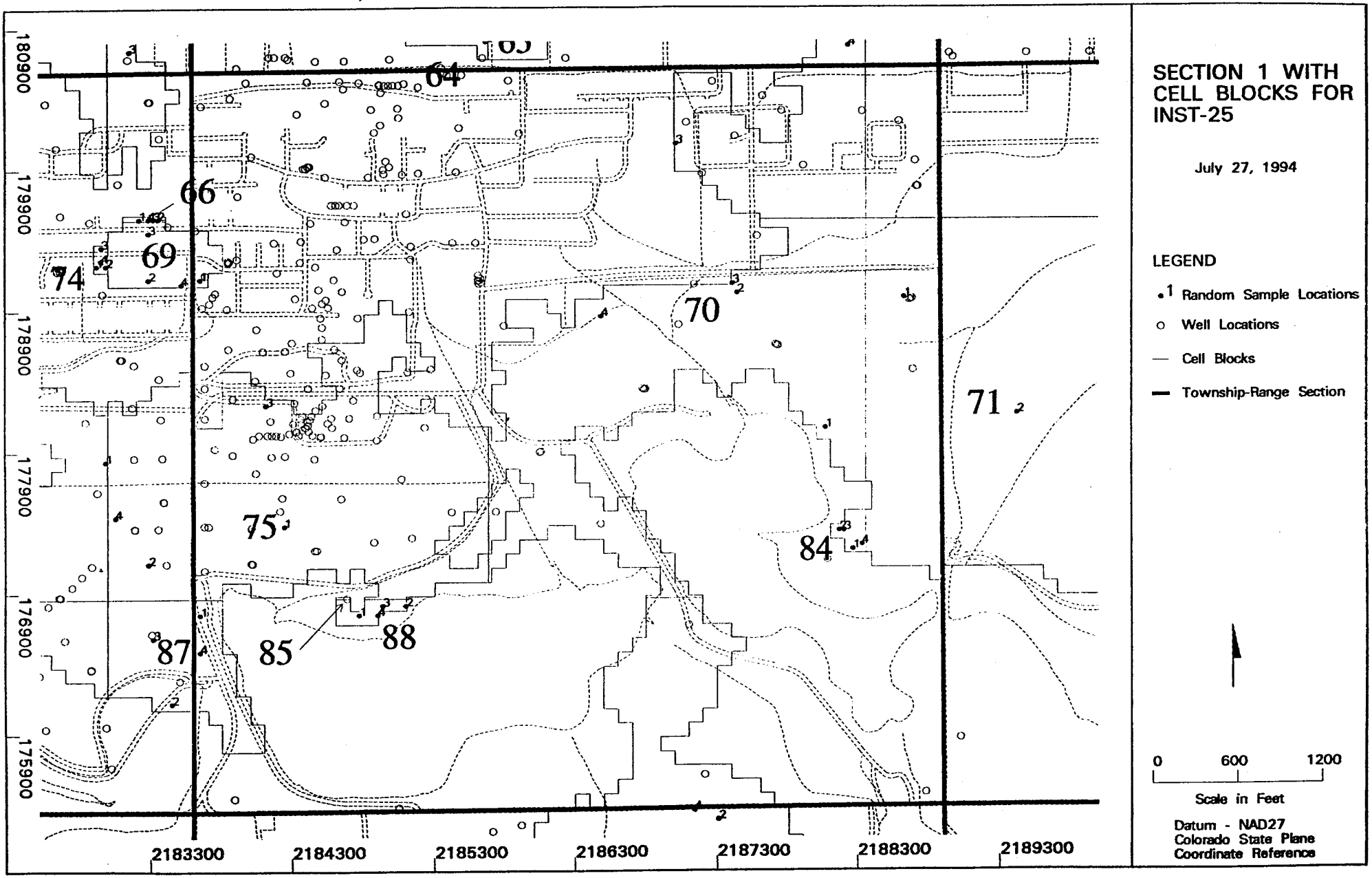
Scale in Feet

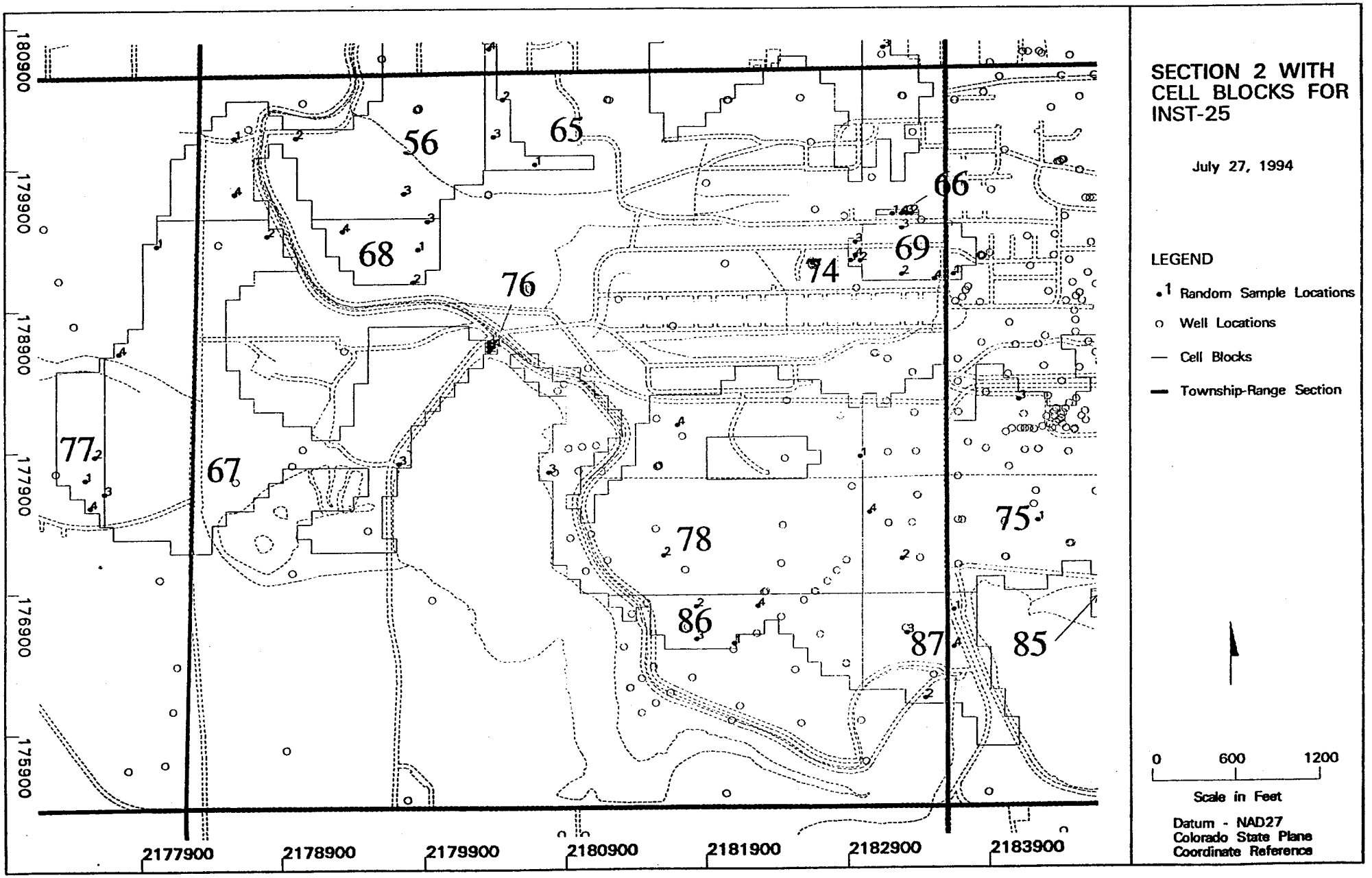
Prepared for:
U.S. Army Program Manager
for Rocky Mountain Arsenal

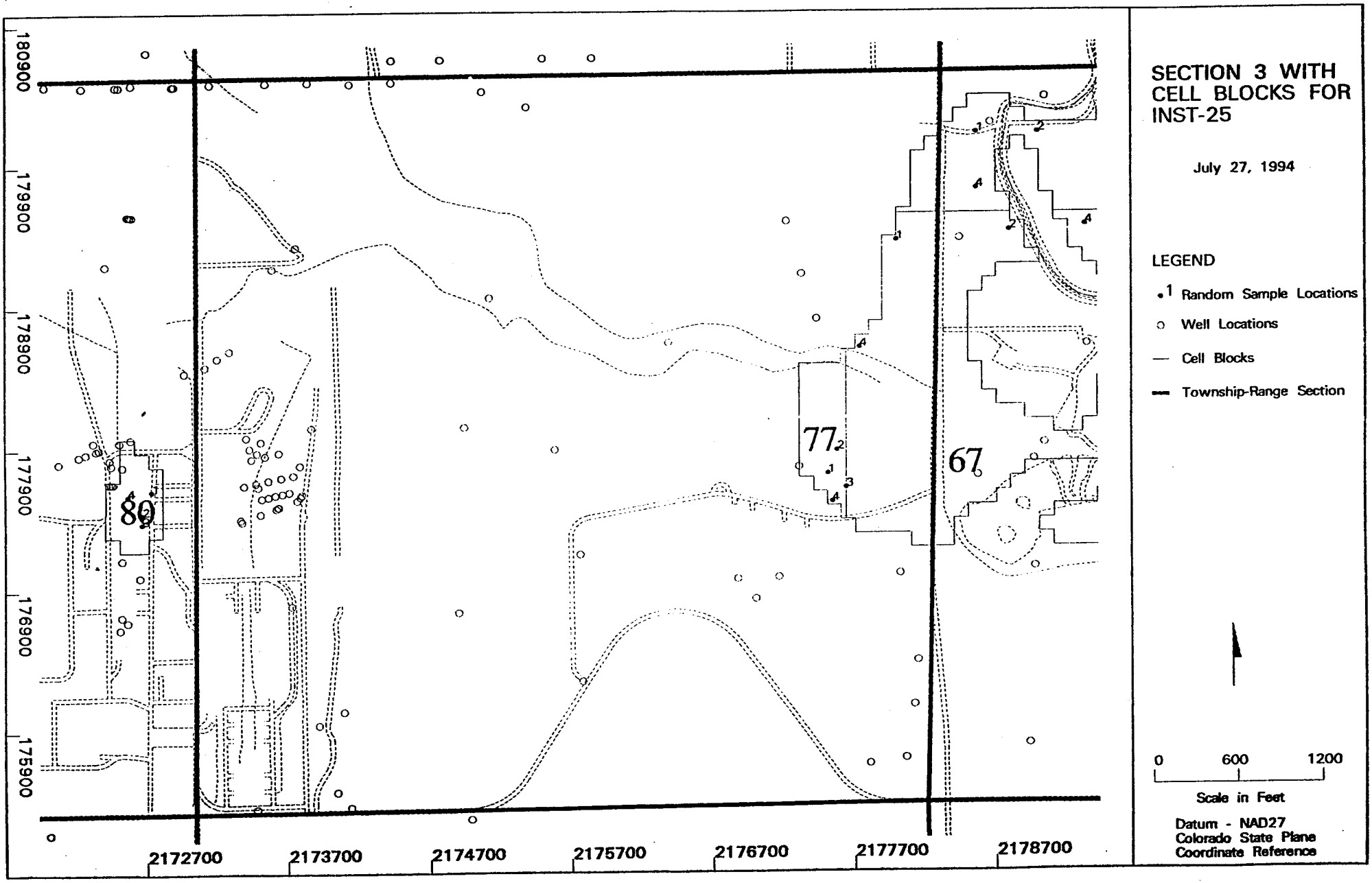
April 1994

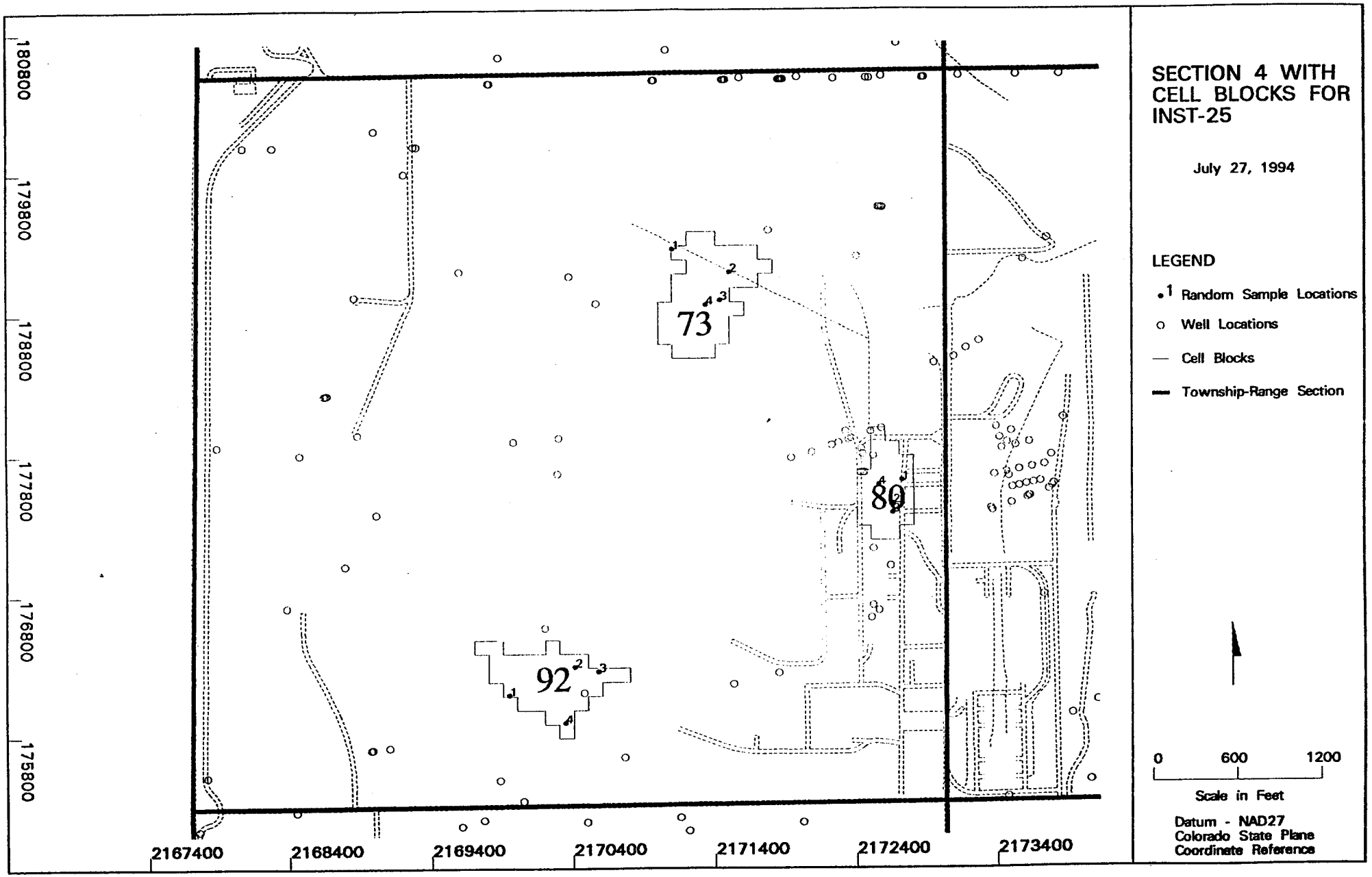
Insect block map with 25 numbered blocks within the AOD

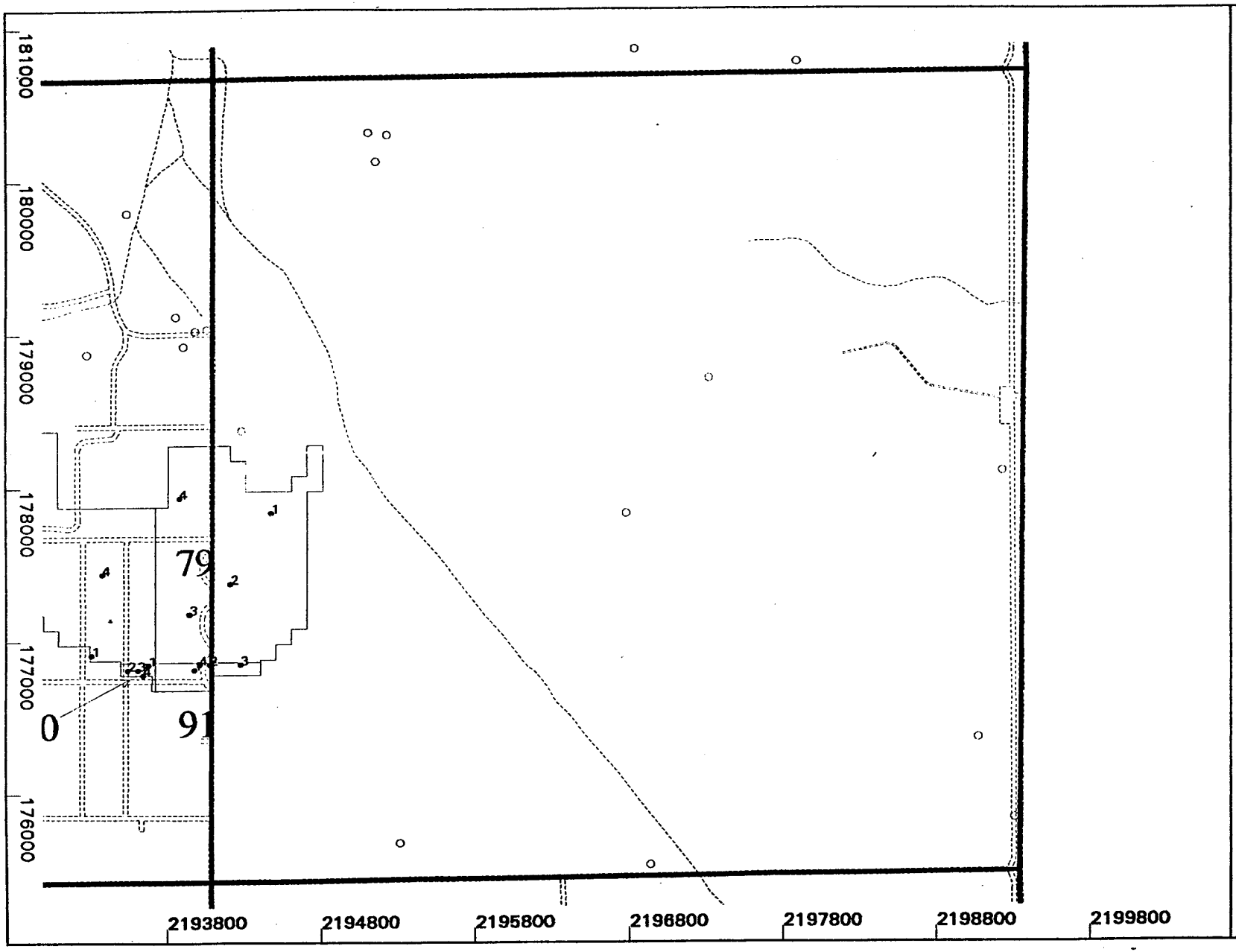
Rocky Mountain Arsenal
Prepared by: ENSERCH Environmental Corp


180900
179900
178900
177900
176900
175900
2183300
2184300
2185300
2186300
2187300
2188300
2189300
64
66
69
74
70
71
75
84
87
85
88
SECTION 1 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 2 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
180900
179900
178900
177900
176900
175900
2177900
2178900
2179900
2180900
2181900
2182900
2183900
56
65
66
68
76
74
69
77
67
78
75
86
87
85


180900
179900
178900
177900
176900
175900
2172700
2173700
2174700
2175700
2176700
2177700
2178700
80
77
67
SECTION 3 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


180800
179800
178800
177800
176800
175800
2167400
2168400
2169400
2170400
2171400
2172400
2173400
73
80
92
SECTION 4 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 5 WITH CELL BLOCKS FOR INST-25

July 27, 1994

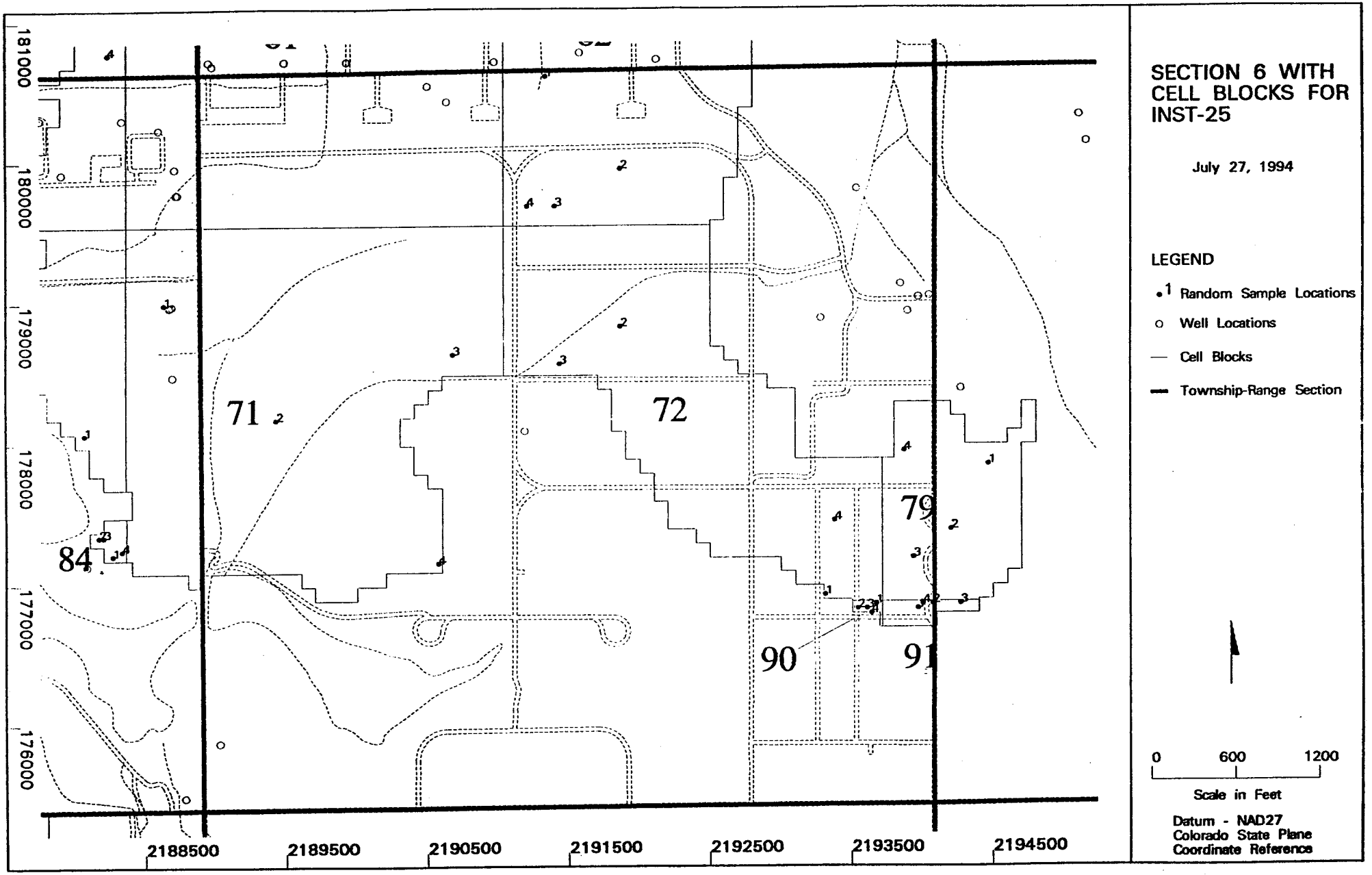
LEGEND

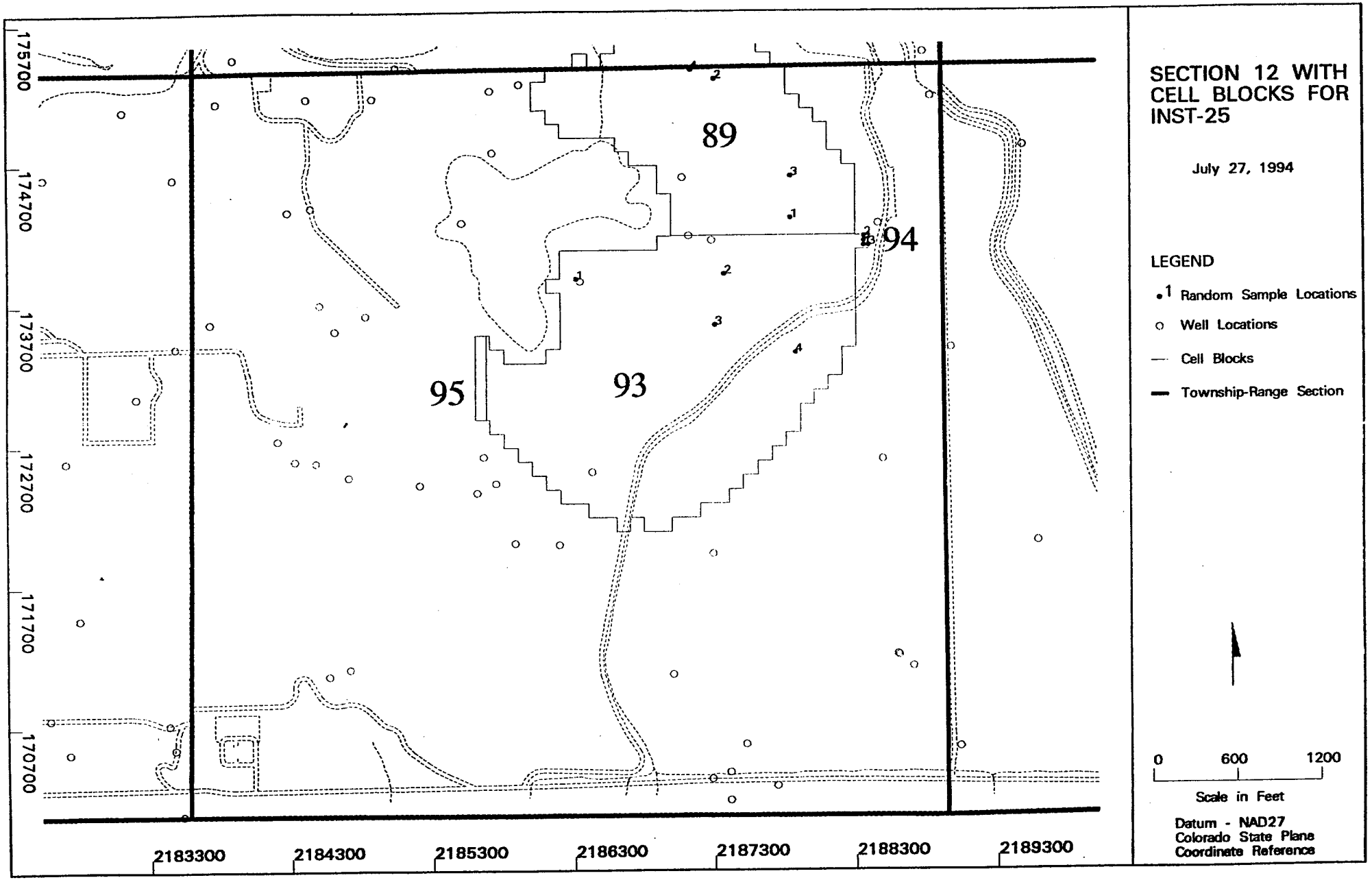
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

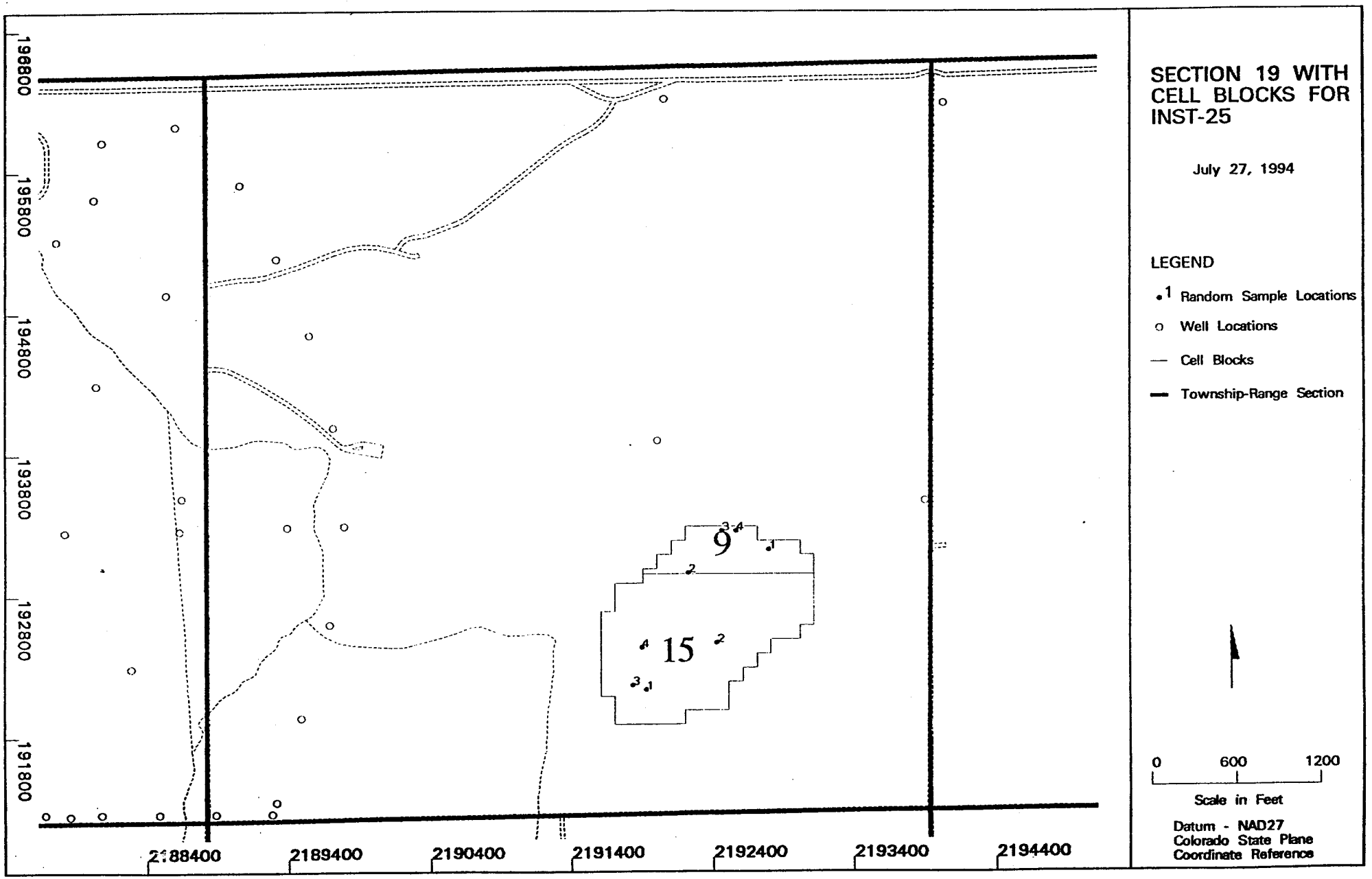
0 600 1200

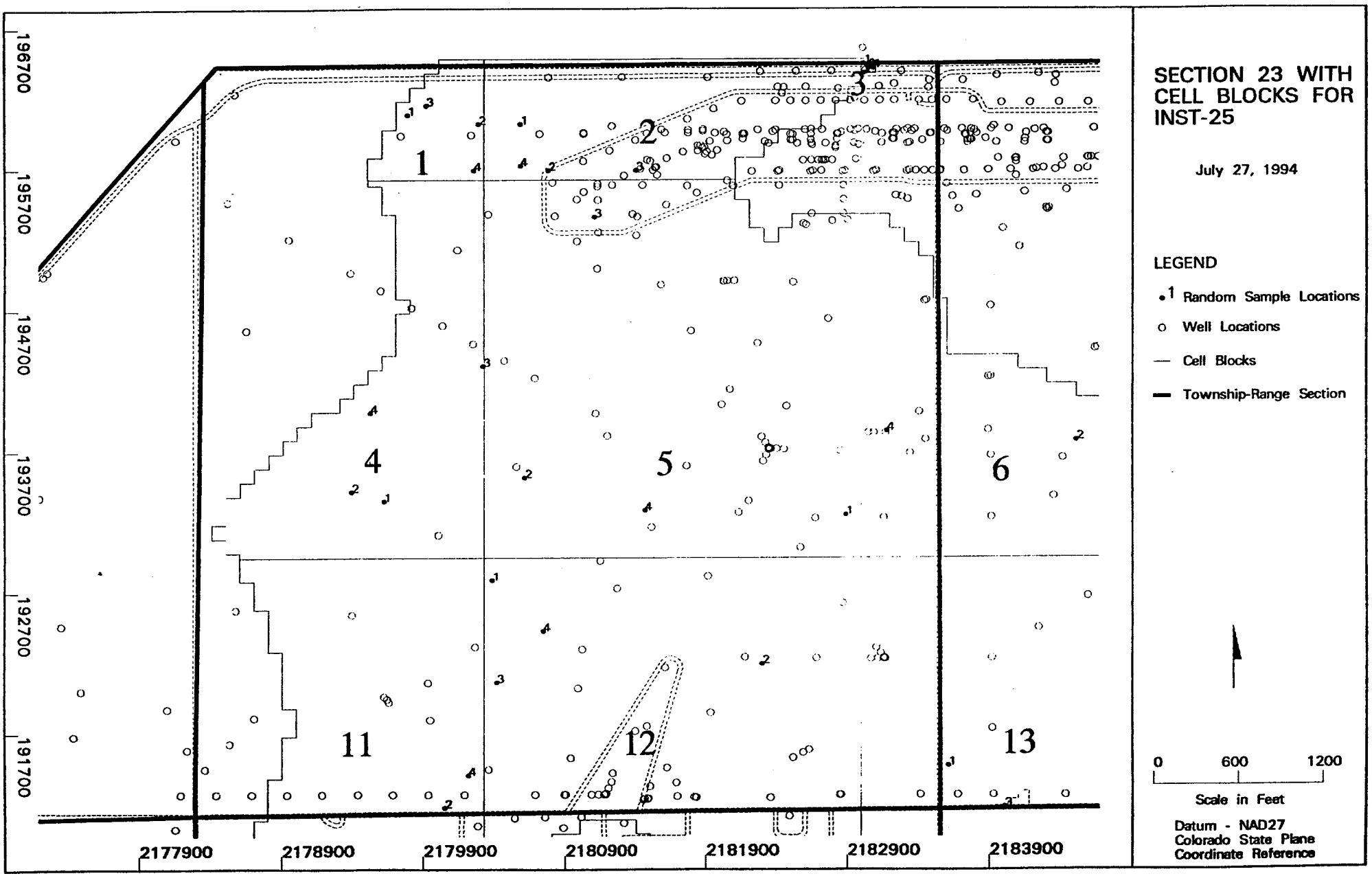
Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference


181000
180000
179000
178000
177000
176000
2188500
2189500
2190500
2191500
2192500
2193500
2194500
71
72
79
84
90
91
SECTION 6 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


175700
174700
173700
172700
171700
170700
2183300
2184300
2185300
2186300
2187300
2188300
2189300
89
94
95
93
SECTION 12 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


196800
195800
194800
193800
192800
191800
2188400
2189400
2190400
2191400
2192400
2193400
2194400
9
15
SECTION 19 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 23 WITH CELL BLOCKS FOR INST-25

July 27, 1994

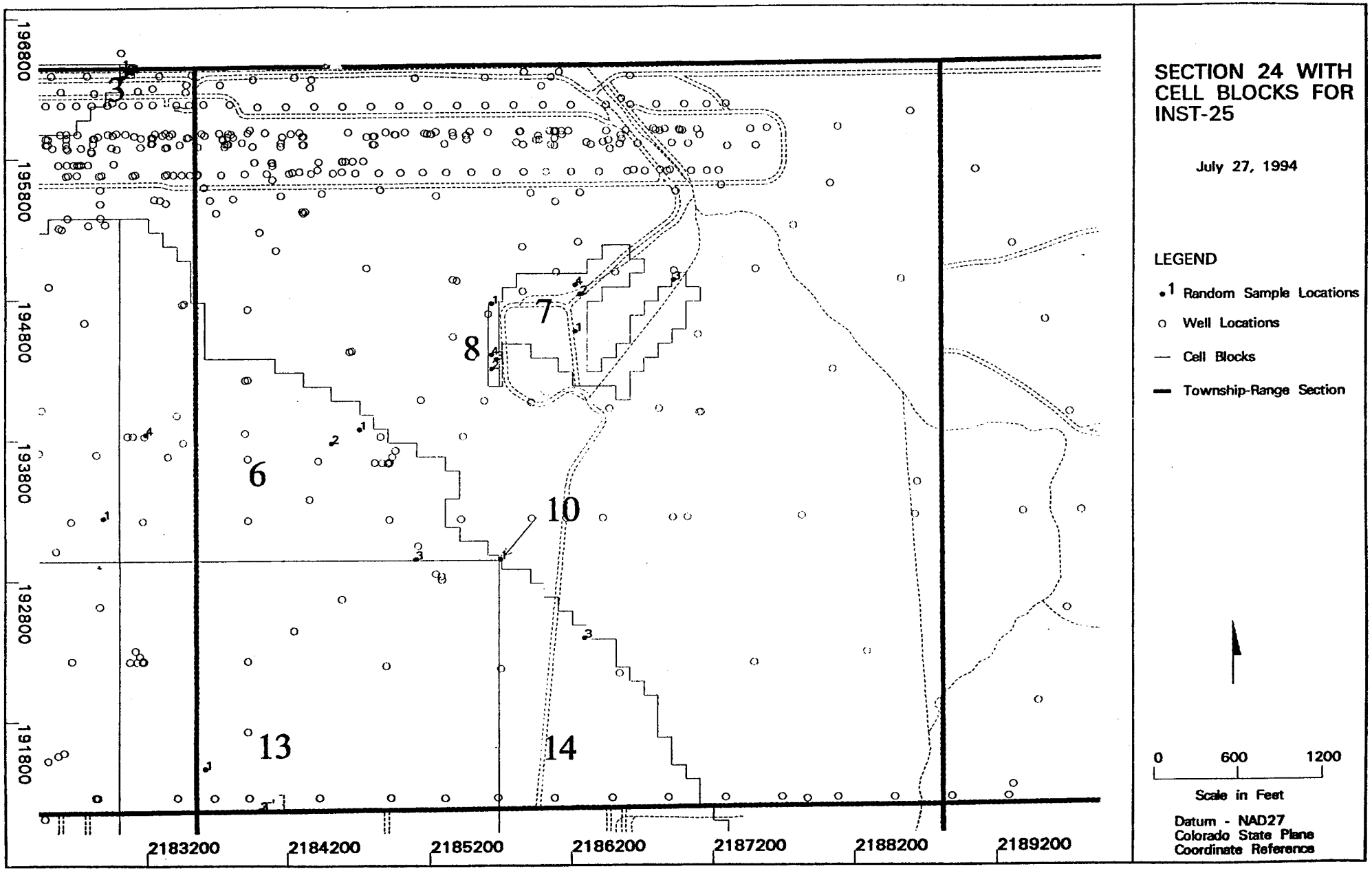
LEGEND

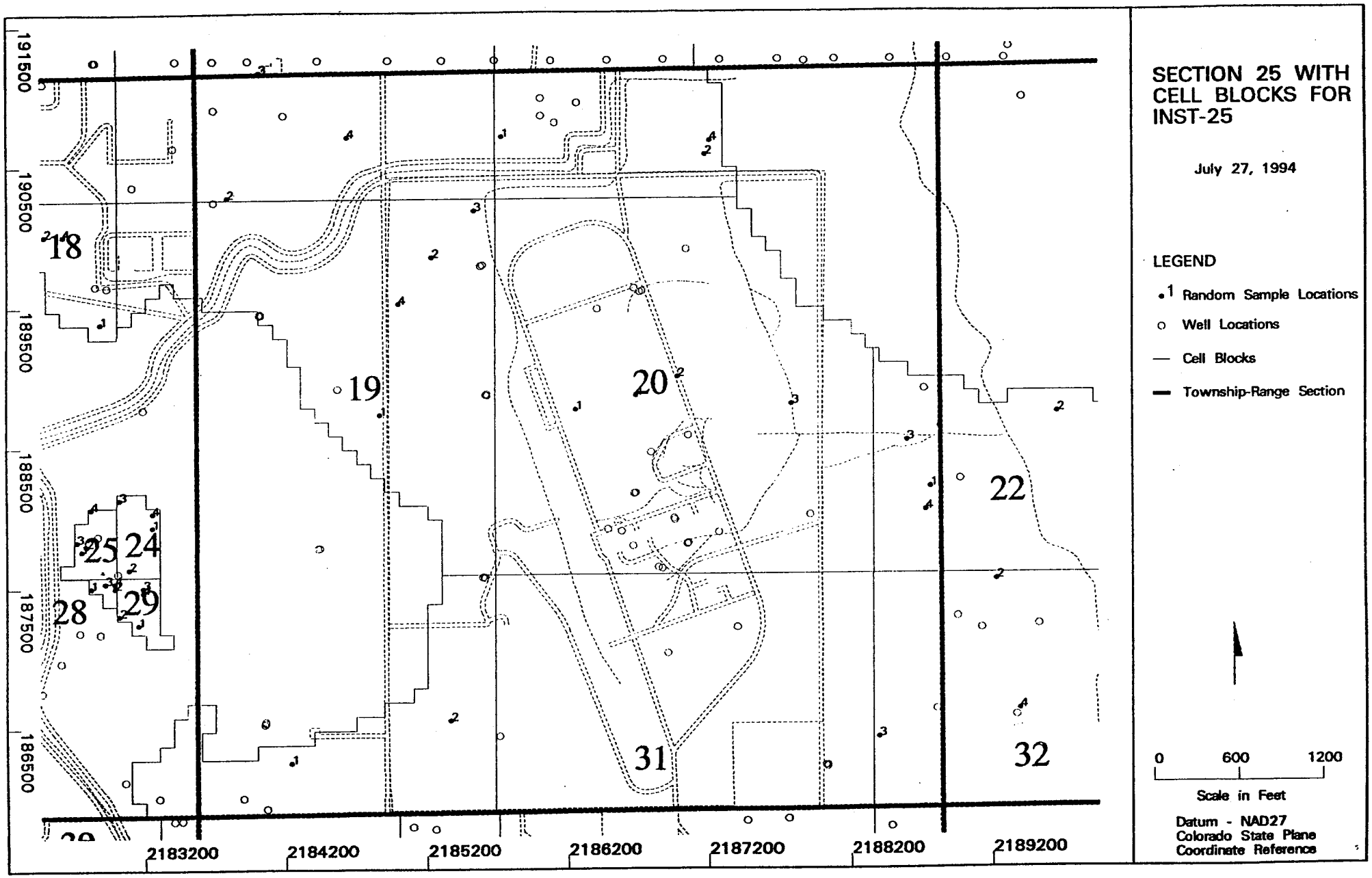
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

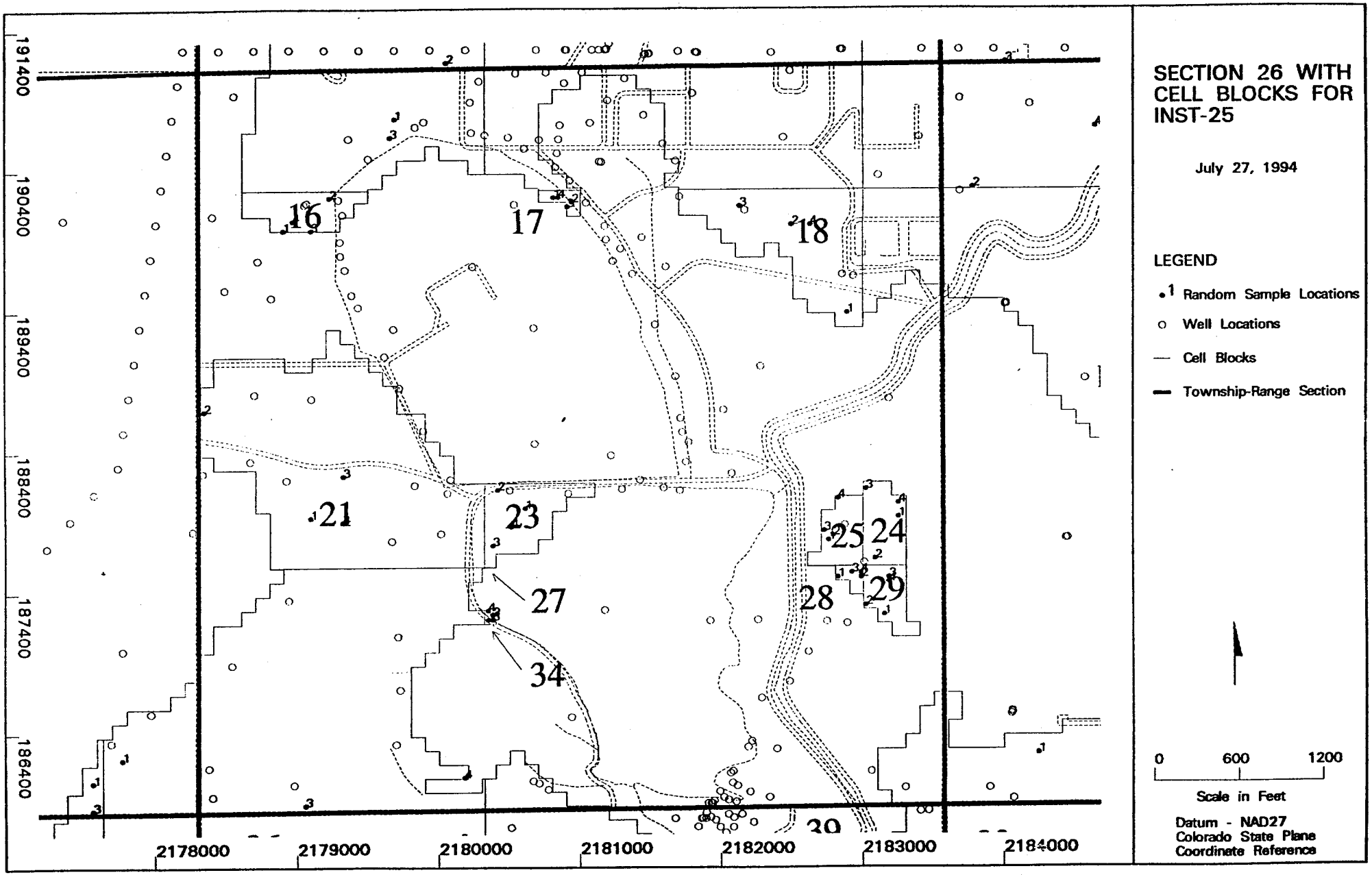
0 600 1200

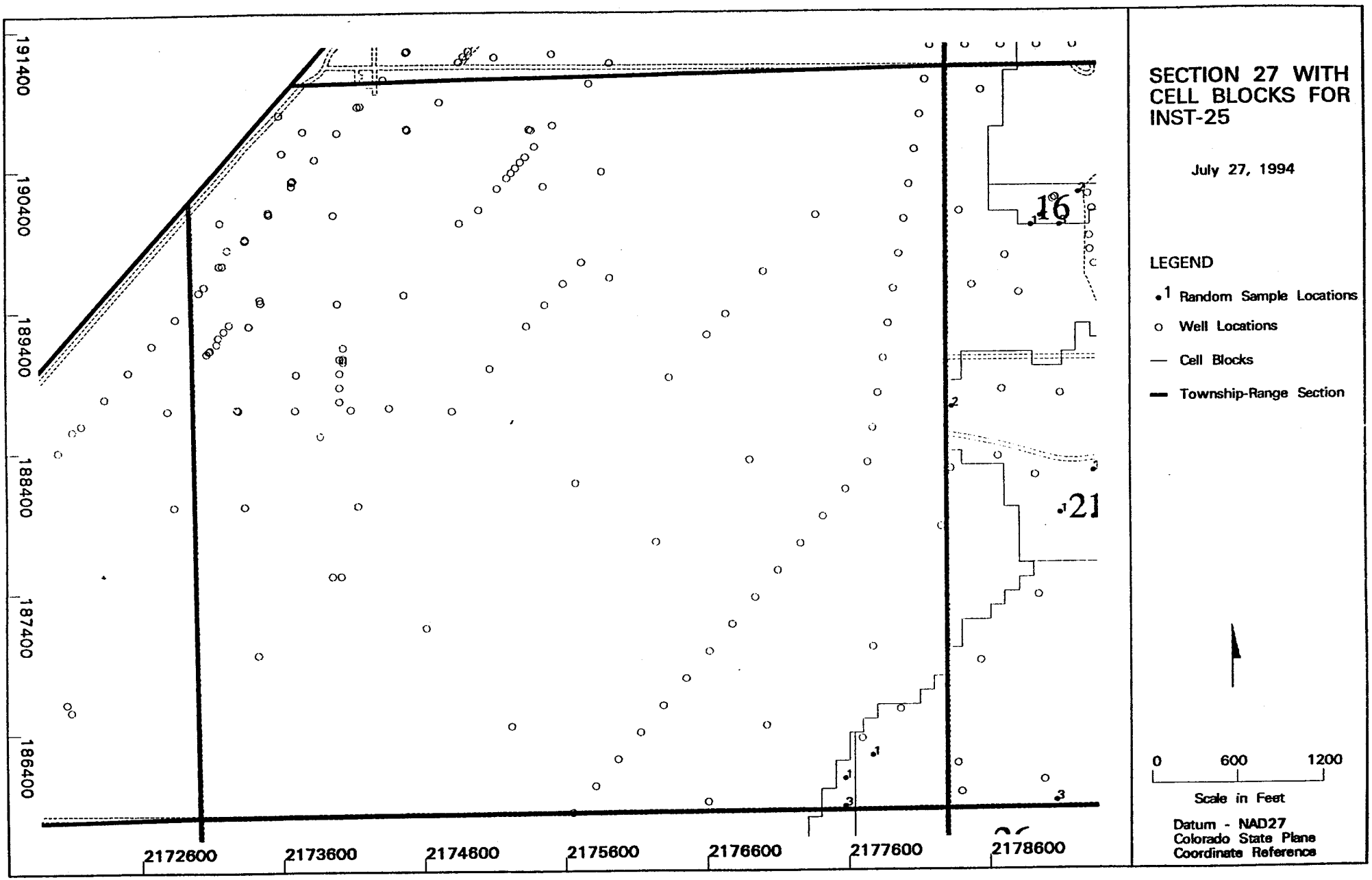
Scale in Feet

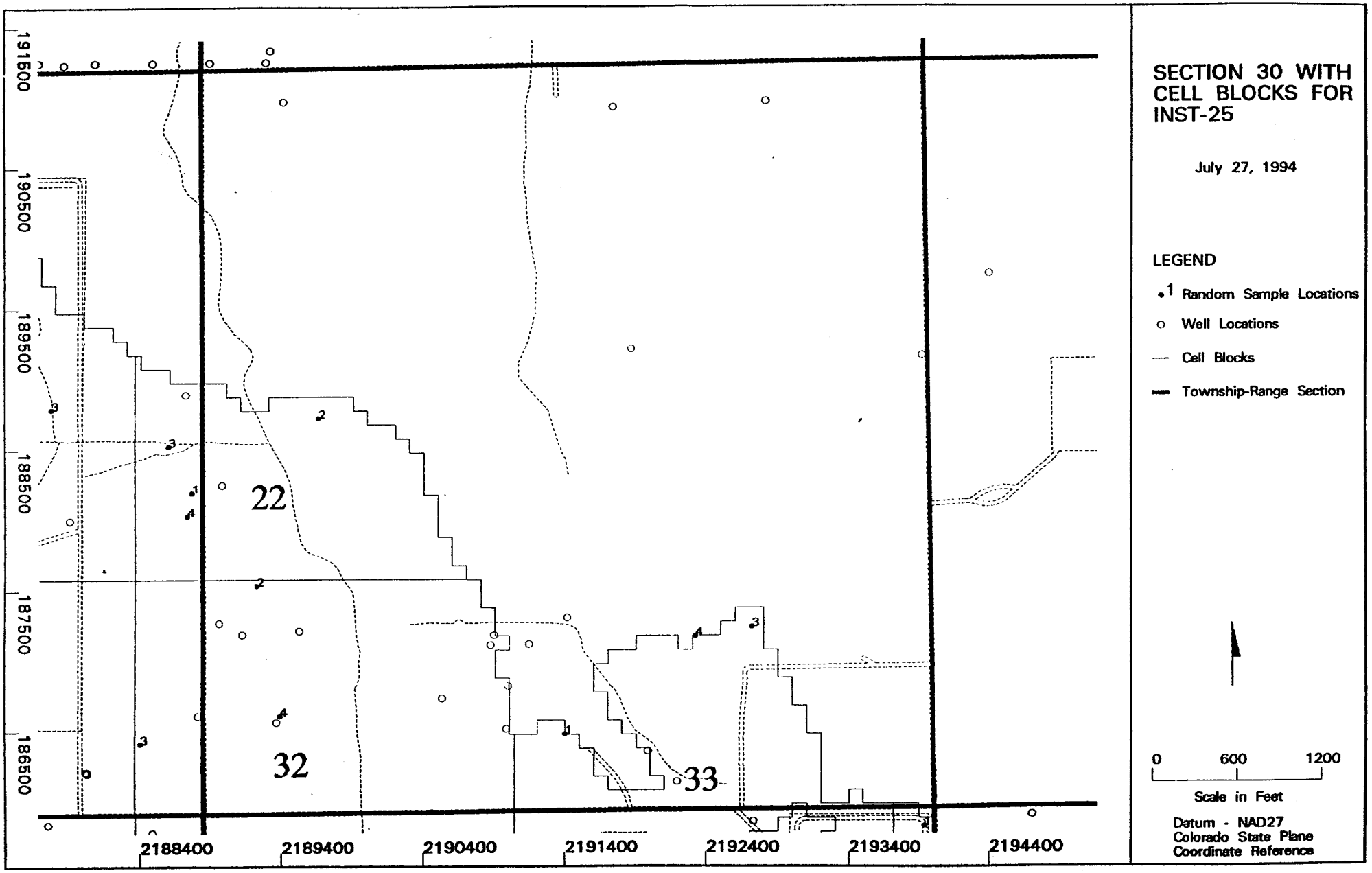
Datum - NAD27
Colorado State Plane
Coordinate Reference

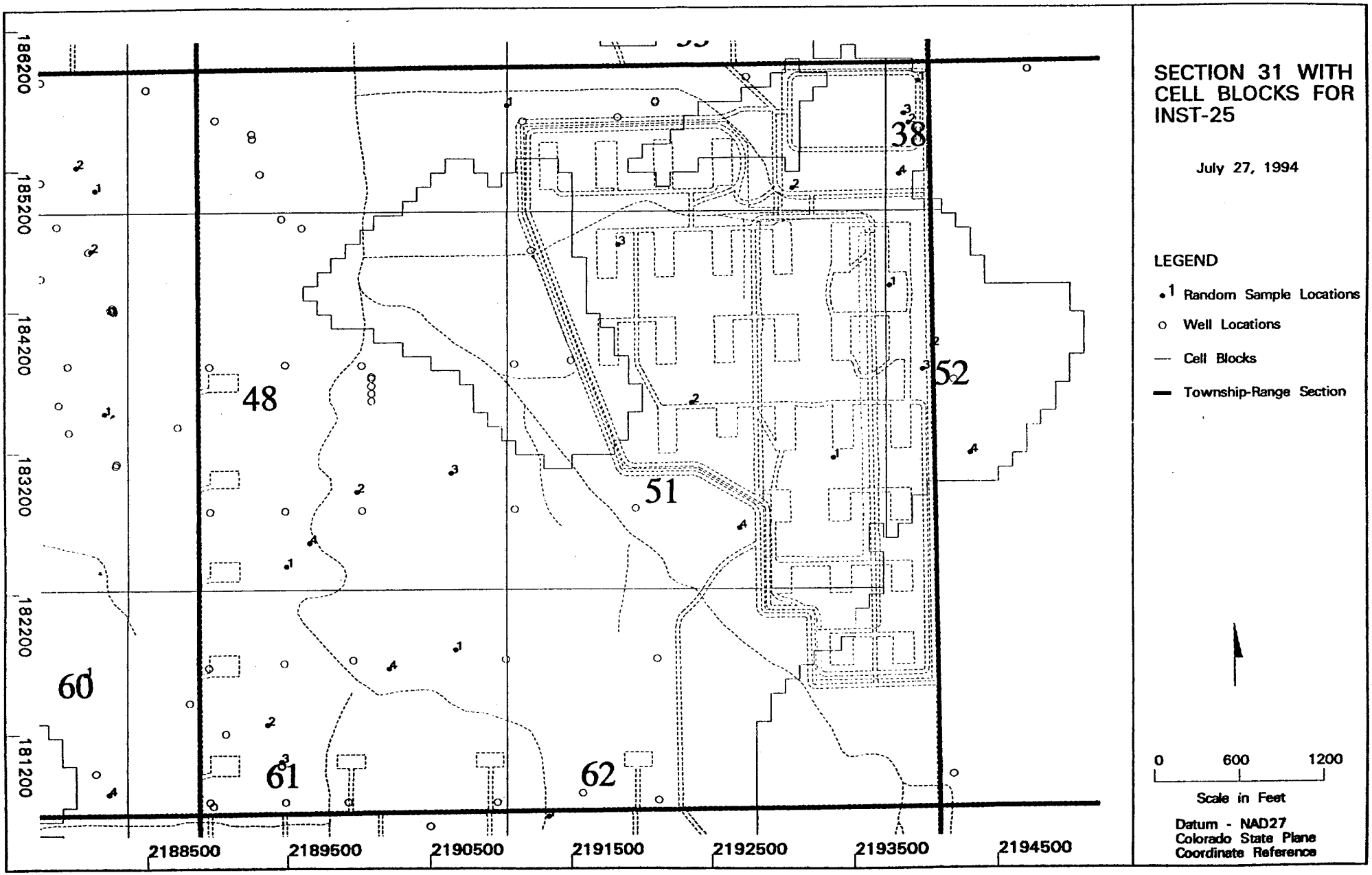

196800
195800
194800
193800
192800
191800
2183200
2184200
2185200
2186200
2187200
2188200
2189200
3
7
8
6
10
13
14
SECTION 24 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference

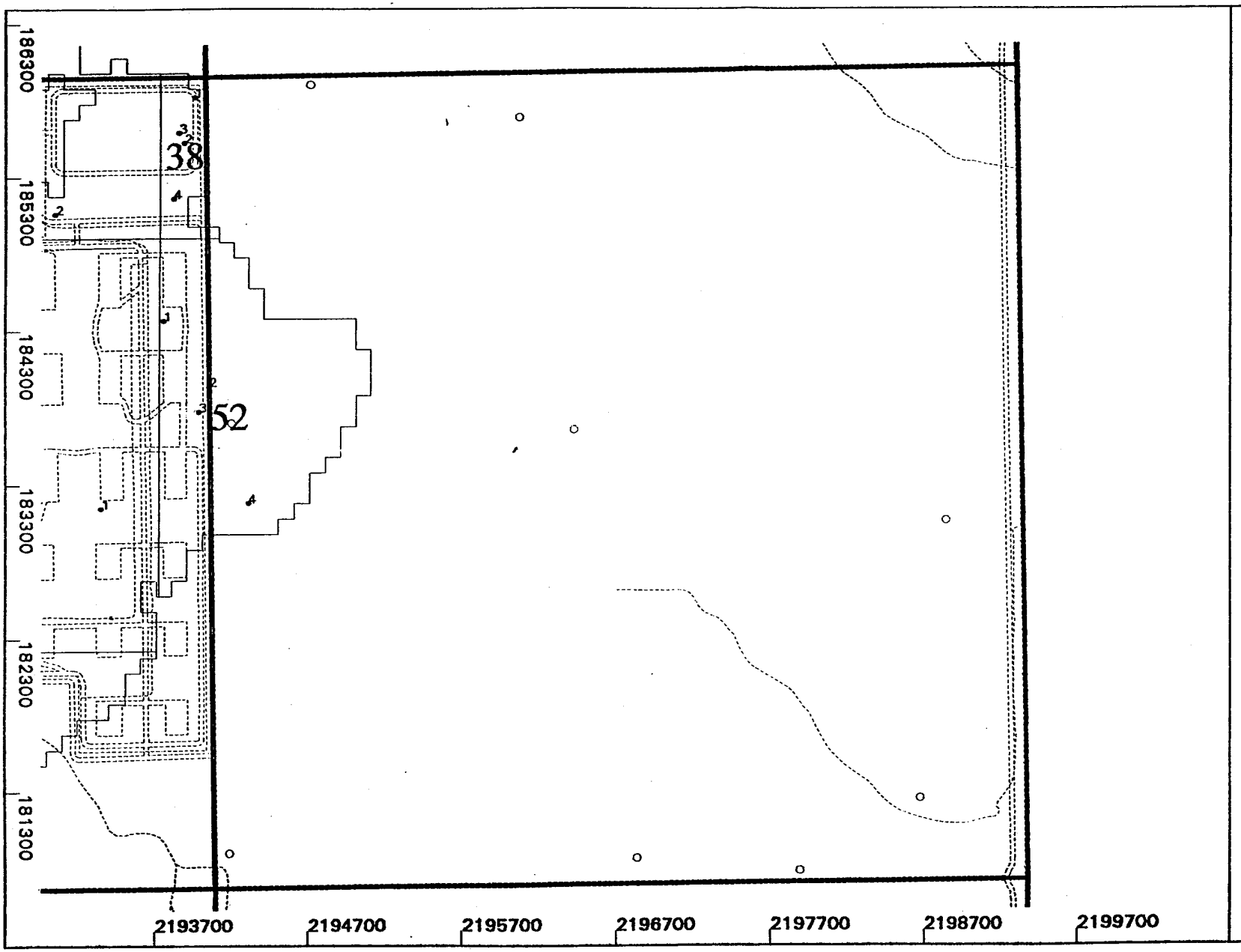

SECTION 25 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane Coordinate Reference
191500
190500
189500
188500
187500
186500
2183200
2184200
2185200
2186200
2187200
2188200
2189200
18
19
20
22
25
24
28
29
31
32


191400
190400
189400
188400
187400
186400
2178000
2179000
2180000
2181000
2182000
2183000
2184000
16
17
18
21
23
25
24
27
28
29
34
SECTION 26 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


191400
190400
189400
188400
187400
186400
2172600
2173600
2174600
2175600
2176600
2177600
2178600
16
21
SECTION 27 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


191500
190500
189500
188500
187500
186500
2188400
2189400
2190400
2191400
2192400
2193400
2194400
22
32
33
SECTION 30 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 31 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
38
52
48
51
60
61
62
186200
185200
184200
183200
182200
181200
2188500
2189500
2190500
2191500
2192500
2193500
2194500
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference



SECTION 32 WITH CELL BLOCKS FOR INST-25

July 27, 1994

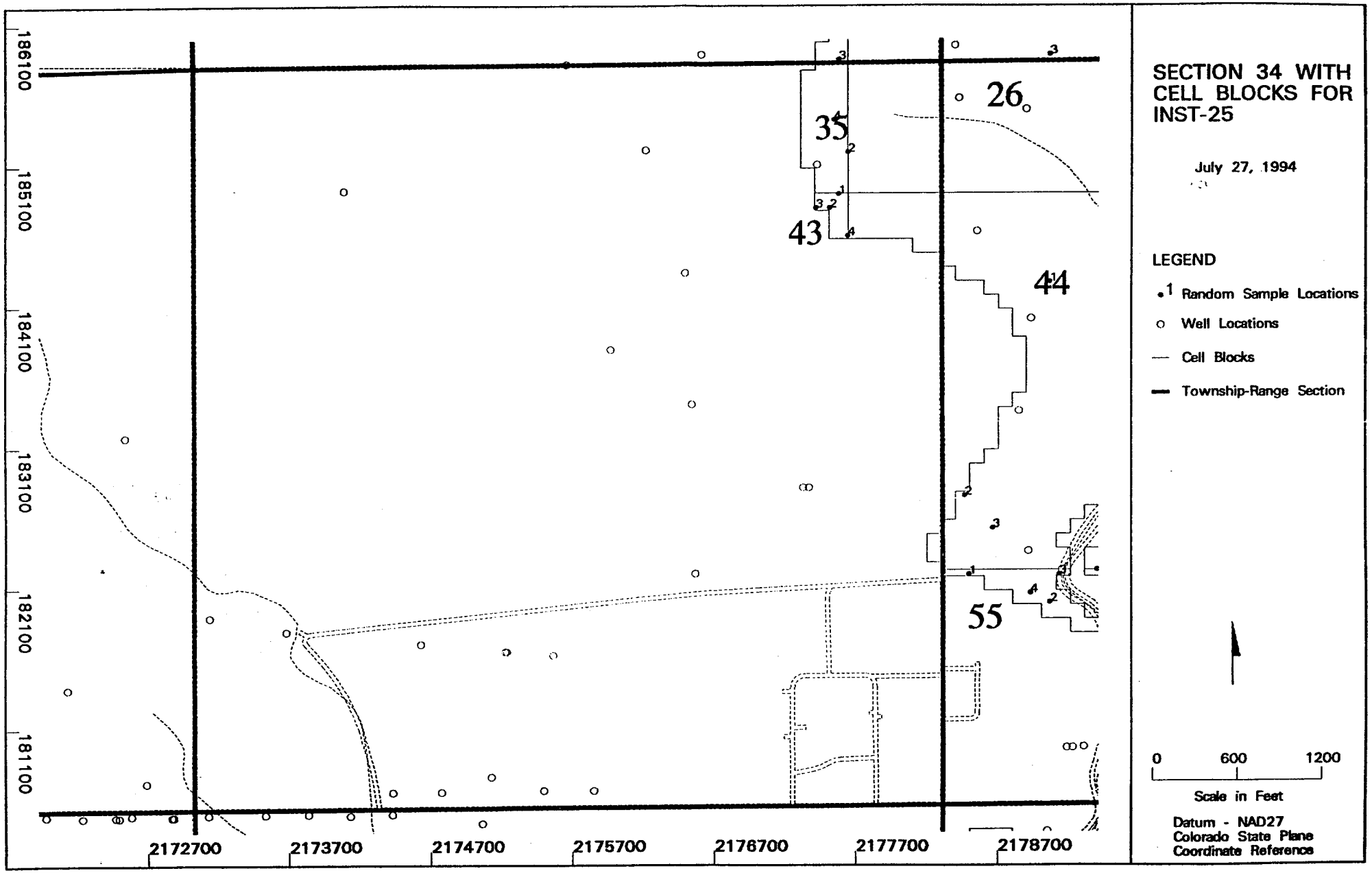
LEGEND

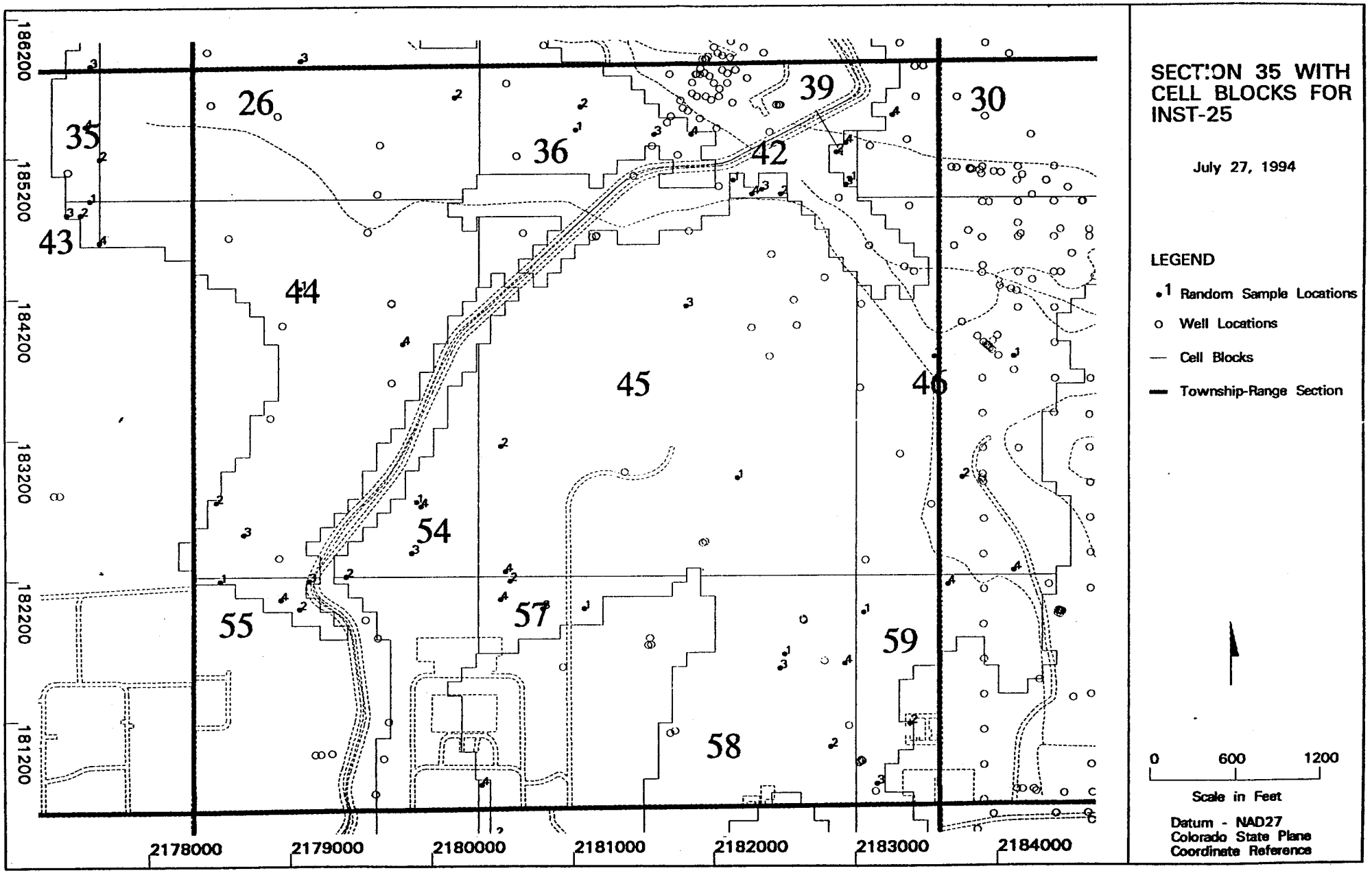
- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

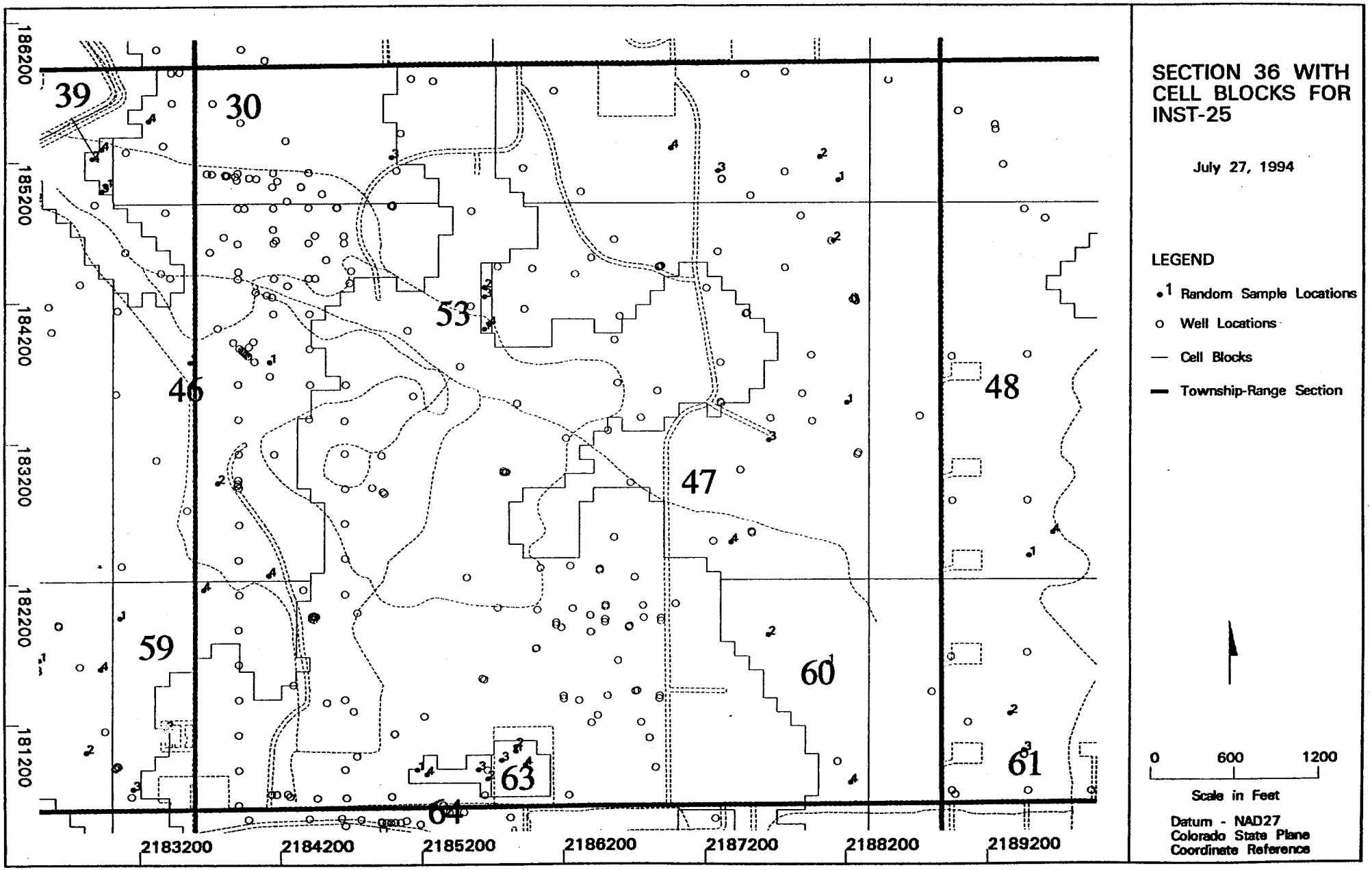
0 600 1200

Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference


186100
185100
184100
183100
182100
181100
2172700
2173700
2174700
2175700
2176700
2177700
2178700
26
35
43
44
55
SECTION 34 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0
600
1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference


SECTION 35 WITH CELL BLOCKS FOR INST-25
July 27, 1994
LEGEND
1 Random Sample Locations
Well Locations
Cell Blocks
Township-Range Section
0 600 1200
Scale in Feet
Datum - NAD27
Colorado State Plane
Coordinate Reference
186200
185200
184200
183200
182200
181200
2178000
2179000
2180000
2181000
2182000
2183000
2184000
26
35
36
39
30
42
43
44
45
46
54
55
57
58
59



SECTION 36 WITH CELL BLOCKS FOR INST-25

July 27, 1994

LEGEND

- •1 Random Sample Locations
- o Well Locations
- — Cell Blocks
- ▬ Township-Range Section

0 600 1200

Scale in Feet

Datum - NAD27
Colorado State Plane
Coordinate Reference

Appendix E

Personnel Assigned to Roles in the SFS-Phase I Program and How to Contact Them

SUPPLEMENTAL FIELD STUDY PERSONNEL ASSIGNMENTS AND CONTACT INFORMATION

ORGANIZATION/Task/Role	Designated Person	Contact Information
EBASCO ENVIRONMENTAL		
Oversight		
Program Manager	Mike Amdurer	303-980-3556[1/]
Task Manager	Susan Osborn	303-980-3588[1/]
Element Manager	Fred Applehans	303-980-3542[1/]
Technical Lead	D. Jean Tate	303-980-3564[1/]
Field Coordinator	Kristen Johnson	303-980-3591[1/] 303-287-2975 (field trailer Z97)
Field Team	Michael Jones E.J. Koford Kent Mahanna Matt Pangle Steve Faulk Mark Billman	303-980-3591[1/] 916-921-2525[2/] 303-980-3785[1/] 303-980-3596[1/] 303-980-3770[1/] 303-980-3754[1/]
Statistical Lead	Kristin Cothern	206-451-4209[3/]
Accident Prevention Safety*		
Health and Safety Manager	Dina Sassone	303-980-3763[1/]
Health & Safety Site Manager	Stephanie DeWitt	303-980-3750[1/]
Quality Assurance/Quality Control		
QA Manager	Paul White	303-980-3620[1/]
QC Manager	D. Jean Tate	303-980-3564[1/]
Data Management		
Project Data Manager	Matt Pangle	303-980-3596[1/]
Procurement		
Project Procurement Liason	Edward Hackstaff	303-980-3557[1/]

ORGANIZATION/Task/Role	Designated Person	Contact Information
U.S. FISH AND WILDLIFE SERVICE		
Personnel Coordinator	Jane Griese	303-289-0232
PROGRAM MANAGER FOR THE ROCKY MOUNTAIN ARSENAL CONTAMINATION CLEANUP		
RMA Security Head	Larry Acosta	FAX: ATTN: AMCPM-RMS-S. Acosta[2/]
Data Coordinator	Carol Occhionero	303-289-0203 FAX: 303-286-6909 ATTN: AMXRM-RM/C. Occhionero[4/]
RMA Shipping Coordinator		
D.P. ASSOCIATES, INCORPORATED		
Regional Manager	Jack Pantleo	Rocky Mountain Arsenal Building 111A
Assistant Regional Manager	Jim Clark	(303) 287-3231 Commerce City, CO 80022

[1/] EBASCO Environmental
143 Union Boulevard
Suite 1010
Lakewood, Colorado 80228
(303) 988-2202 Phone
(303) 980-3539 FAX

[2/] EBASCO Environmental
2525 Natomas Park Drive
Suite 250
Natomas Corporate Center
Sacramento, California 95833-2900
(916) 921-2525 Phone
(916) 921-5124 FAX

[3/] EBASCO Environmental
Plaza Center Building
10900 NE 8th Street - 5th Floor
Bellevue, Washington 98004-4405
(206) 451-4500 Phone
(206) 451-4187 FAX

[4/] Office of the Program Manager
Rocky Mountain Arsenal
72nd Avenue at Quebec Street
Commerce City, CO 80022-2180

* This task and the rules it incorporates are discussed in the APSTP (EBASCO 1994c)